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MANAGEMENT OF DAIRY-FARM STOCK.

III. WINTERING STOCK.

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GOOD judgment in deciding the correct time to commence winter feeding, and the adoption of proper methods in supplying that feed, is not so much in evidence throughout the country as might by now be expected. Instances are still to be observed where sufficient feed has not been provided to meet the requirements of an ordinary winter, and even where this has been done wasteful methods of feeding the supply contribute largely to a shortage before the spring feed appears, a serious loss being thereby sustained. There is a common saying, "If you want to get a farmer to think touch him in the pocket." This may be so, but it is a much more difficult task to make him understand when his pocket is really being touched. A man's pocket may be touched by taking something from it which has been there, but it is more often touched by the fact that there is something not there that should have been there in the first place. By advanced methods various business concerns are now realizing large profits from materials which at one time were going to waste. Of this there are numerous examples. Material for which there was no market when it was in one state has been turned into another for which there is a

demand. "No waste" is the business keynote of all successful undertakings—no waste in time, material, or labour, but a precise knowledge of the value of all three in their relation to each other for the production of satisfactory results. The consideration for the farmer is not only to know how much has been "touched" out of his pocket, but also how much could have been there for the same expenditure.

The first economic mistake made by a large number of farmers in wintering stock is not culling out before the winter sets in and deciding to slaughter or sell off all animals that have outlived their usefulness or are otherwise indicating that another winter's feeding is not going to increase their value or the owner's profit. Before the commencement of every winter is an opportune time to reduce the heads to be fed, leaving those that are not only likely to come through, but to show a profit by doing so. All unprofitable cows, spare horses, &c., should be got rid of. This will leave more feed for the remaining animals, and even where there is to be plenty of feed more profitable animals could be secured. This line of action would be an improvement upon that usually followed by many farmers, who only recognize that the time to get rid of such animals is when they have no more feed to give them, while for the past few months they have been consuming food that should have been given to the other stock which were working for the farmer's benefit.

Another great mistake is often made in delaying the commencement of winter feeding until the stock show appreciable signs of going back. Stock should never be allowed to go back if it can be at all avoided. Animals may fall away so much in a few days or a week that it will take three times as much food to bring them back as it would to have kept them going, it being an accepted fact that animals in good condition consume proportionately less feed than when in poor condition. Not only this, but animals in very fair condition are better able to penetrate into difficult positions to secure food and to climb rough country in search of it. How often have we seen weak cows bogged where a vigorous one could have got out, or weak animals looking for feed in bare gullies while more vigorous stock were scrambling over rough country in search of food and getting it.

There is only one way of giving stock a fair start into winter, and that is to start them strong. Very often the delay in starting winter feeding arises from doubts in the farmer's mind as to whether he will have sufficient feed to carry him through the winter or not. "Better to have some over than go short towards spring" is his motto—and not a bad one providing that it has not been at the expense of his stock that he has some over. A little feed to spare after a steady ration has been supplied to the animals all through the winter is an indication of good management, but to allow the condition of the animals to go down in early winter and have feed to spare when spring comes is surely bad judgment.

Another common cause of heavy loss in some seasons lies in the uncertainty as to the length or severity of the winter. In a given season a farmer provides what he considers reasonable winter feed, and finds that he has provided too much; next year he provides less, and may be lucky; but sooner or later misfortune befalls him because of his not adopting the simple practice of having a few weeks' or months'

feed (such as hay, ensilage, or straw) always on hand as a reserve, which would keep if not required.

The unbusinesslike manner in which a very large number of young stock are treated during winter also represents yearly a heavy loss. Take young calves, for instance: In most cases they receive fair treatment until they are weaned, and if it is the intention to sell them they are kept with a presentable appearance until then. They then change hands, when, instead of being kept going in growth and condition, they are very often turned out upon a ferny or scrubby piece of land to shift for themselves; in fact, they are laid aside, so to speak, until required. The results are often disastrous: some die early, others survive the winter and emerge into spring emaciated, scouring, and weary of life, their vitality lowered to such an extent as to render them an easy prey to most diseases. Their heads have grown, their bellies are distended, and their sex unchanged, and that is their only recommendation. Then from such a lot the farmer starts afresh to build up what never should have been lost. It is a safe estimate that, taking the general run of such animals, six months' time will be lost in bringing them to maturity, besides which there are the reductions in numbers through deaths, and a legacy of increased susceptibility to disease. Much the same treatment is often adopted with in-calf heifers, but here the neglect to supply them with sufficient nourishment is much more serious than in dealing with calves. Here is a young undeveloped animal, having still to add to her own constitution a large amount of bone and muscle, being called upon to do the double duty of providing not only for her own requirements but also for her young, often under circumstances where she has been given little to do this with, the result being that both the heifer and her young suffer.

That there is a great opening for the more scientific study of wintering stock is undoubted. To have animals in good condition and then allow them to fall away without any corresponding gain, or to have to keep animals six months longer until they are profitable, surely means waste. The first cost of working on good lines might be more, but the results would very much more than cover any additional expenditure and leave a balance to the good.

Another saving might very well be effected by the more careful handling of winter feed. It is no uncommon sight to see cattle having free access to hay or straw stacks, no provision being made to limit the supply to actual requirements, the result being that the animals will naturally destroy a large amount by tramping it underfoot. This is more especially seen with straw stacks, where the stock in their desire to obtain fine pickings of grass, &c., will pull out straw and leave it if it does not contain the titbit they are after. Yet this straw would have been eaten by them readily enough in time had it been given to them as required, and its value as a factor in balancing the ration would have been of much profit instead of waste.

Then, again, we see upon far too many farms cattle being allowed to wander all over turnip-fields from the very first day they are put in, instead of being given fresh sections as the others are used up. Allowing cattle the run of the whole field to start with is a wasteful method, as the removal of the tops and the damage done to the body of the turnip without finishing off effectually stop any further growth

that might otherwise be made in the early part of winter. Not only this, but a half-eaten turnip or mangold commences to deteriorate at once in feeding-value. Cattle should only have suitable sections of a turnip-field at a time, with a large run-off provided to encourage them to go there and bed down, thus keeping their principal feeding-ground clean. This method also allows of the portion still fenced off attaining the greatest possible weight of feed. By following this plan, also giving the hay or straw only in such quantities as will be consumed every day, it will be found that the profit taken out of the same field has been considerably increased.

SHELTER.

The planting of shelter in suitable parts of the farm for the purpose of protecting stock from cold, biting winds has not received the attention it merits, even from many practical men. One great hindrance to this good work has been the short time some farms have been occupied by the same owner, and the common aversion of doing anything for the next man's benefit. Even in this, however, a speculative error has been committed, as a farm with plenty of trees and shelter coming on to be of use is more valuable to sell than another farm of the same quality without. The present holders of land therefore cannot do better than to set about planting all spare corners, gullies, river-banks, and other such suitable places. If they sell it will pay; if they do not sell it will pay handsomely, because trees can be planted to provide shelter, posts for fencing, and firewood, which would in a very few years recompense many times over for all the trouble and outlay, while the more valuable but slower-growing timber would make sufficient growth to take their place. There is an old saying that it is not what a man earns but what he spends that counts, and this just about hits the mark here. It is not the amount of good food you give to an animal to produce heat, but the measures taken to prevent undue waste of heat that counts profit.

If there is one subject more than another that leading agricultural papers in the Dominion have drawn special attention to time after time it is that of sufficient shelter for stock. It is recognized that the annual loss to the country sustained by the want of shelter alone runs into hundreds of thousands of pounds. The question for every stockowner to ask himself is, "Am I suffering loss from this cause?" and, if so, to set to work upon the remedy. I would appeal to all farmers for a more humane consideration of the welfare of stock, because, even to this day, farms can be seen upon every hand where the only shelter provided is a barbed-wire fence. As already emphasized, the provision of proper shelter will not only contribute to the comfort of the stock and pleasure of the stockowner, but it will pay well.

Stratford Model Dairy Farm.—The sowing of swedes was completed in December, and all root crops are doing well; thirty-two varieties of swedes, fourteen varieties of turnips, and eleven varieties of cabbages are being tested, also several millets, kales, &c.

PASTEURIZATION IN CHEESE-MANUFACTURE.

C. STEVENSON, Dairy Instructor, New Plymouth.

THE chief difficulty hitherto experienced in connection with the pasteurization of milk for cheesemaking, that of heating large quantities of milk in a somewhat limited time, may be entirely overcome by the adoption of the regenerative heaters now procurable. These machines, while heating to 165° F., have a capacity of up to 1,800 gallons per hour, consequently by running a machine for two hours and a half—the time available in most factories—4,500 gallons of milk can be treated. By installing a duplicate plant 9,000 gallons can be heated in the same time, a capacity sufficient for the largest cheese-factories in the Dominion. In addition, these machines are extremely economical to run, as while working at full capacity a regeneration of 40° to 45° is obtained, thus effecting a very considerable saving in the cost of heating.

A complete plant consists of a milk-receiving vat, a regenerator, two pumps, and a large cooler, the floor-space necessary for installation being 12 ft. to 14 ft. in width by about 20 ft. in length. Some variation in placing the plant can be made in order to utilize the space which may be available in factories not specially designed for the installation of a pasteurizing plant. A milk-receiving vat with a holding-capacity of 500 to 600 gallons is sufficiently large, and where floor-space is available it is advisable to make such vats not more than 2 ft. 6 in. in depth in order to facilitate cleaning.

Two types of regenerator are at present in use, one of which discharges the milk at the top, and the other at the bottom. In both cases it is necessary to pump the milk from the receiving-vat into the regenerator, but with the former machine the milk is discharged directly to the cooler, after leaving which it is pumped to the cheese-vats. With the latter machine, discharging at the bottom, it is necessary to pump the milk from the regenerator to the cooler, which is set sufficiently high to allow the milk to gravitate to the cheese-vats. Each machine is fitted with a steam-inlet sufficiently large to utilize exhaust steam where available.

The coolers provided in most cases are of the horizontal tubular type, 12 ft. long by 4 ft. high, fitted with two water-inlets and a corresponding number of discharges, and these have been found very suitable for the work. Where high-pressure water is not available the tank supplying water to the cooler should be placed about 5 ft. higher than the top of the cooler in order to ensure a constant supply of fresh water. Where insufficient fall is provided the water passing slowly through the cooler becomes heated and considerably retards the cooling of the milk.

Only the best drawn brass piping should be used in connection with the milk-pumps, and this should be fitted in short lengths and jointed with brass unions so that it may be easily dismantled for cleaning.

In keeping with all other commodities, there has recently been an increase in the price of these heaters, the cost of installing a plant capable of dealing with 1,800 gallons of milk per hour being at the present time from £380 to £400.

Although it is evident that in heating milk to 160° – 165° as against a temperature of 86° to 90° required under the unpasteurized system of cheese-manufacture there must necessarily be an increase in the amount of fuel used, a comparison of the two methods of heating will readily show that this increase is not nearly so great as would at first appear to be the case, the system of heating milk in a jacketed vat being a very extravagant one; whereas that of heating by means of the regenerator is most economical, the machines being so constructed that they utilize to the fullest possible extent every unit of heat applied.

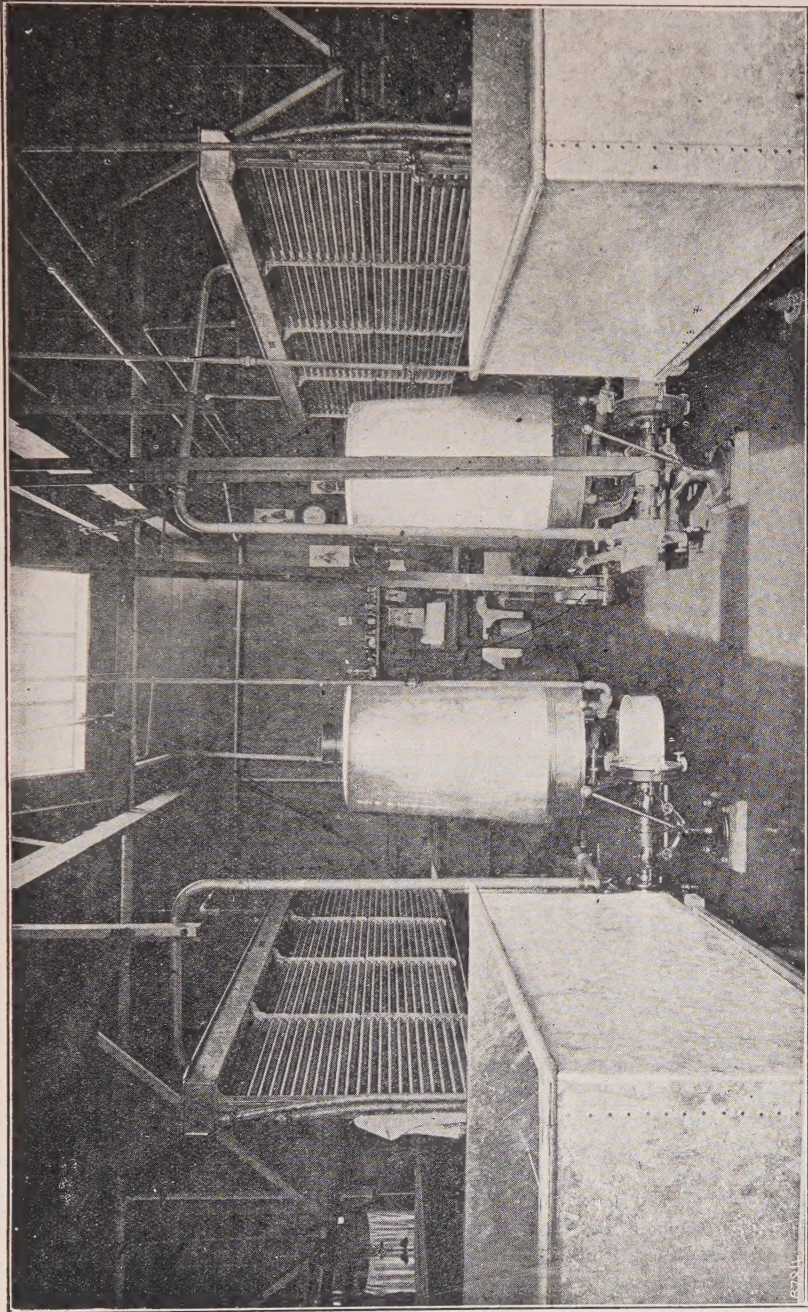
It is difficult to obtain exact figures relating to the increase in fuel-consumption, but observations made during the last three years indicate that where live steam is used the increase is from 10 to 15 per cent.; where exhaust steam is fitted to the regenerator there is practically no increase in the amount of fuel used.

The supply of water for cooling purposes should not present any difficulty. As the milk is delivered to the cooler at a temperature of 115° to 120° , and requires only to be further cooled to setting-temperature— 86° to 90° —no very great quantity of water is required for this purpose. By installing a small pump the waste water from the cooler, which is perfectly clean though slightly warm, can be pumped to an elevated tank and used again for ordinary factory purposes.

The improvement in the quality of the cheese made from pasteurized milk as compared with that made under the old system has been very marked indeed. Numerous instances could be given where the average grading of a factory's output has risen from two to three points after the installation of the pasteurizing plant, and in most factories where pasteurization is carried on second-grade cheese has been almost entirely eliminated. The improvement in keeping-quality has been particularly in evidence during the past three seasons when it became necessary, owing to lack of shipping-facilities, to hold the cheese in cool store for long periods. Cheese made from properly pasteurized milk maintained its quality very much better under storage conditions than that made from milk which had not been pasteurized. Further, with pasteurization the milk dealt with for manufacturing is in practically the same condition from day to day, and consequently a very much greater degree of uniformity in the quality of the cheese can be obtained.

Although the improvement in the quality of the cheese is perhaps the chief benefit to be derived from pasteurization, there are several other advantages which clearly prove that the installation of a pasteurizing plant in cheese-factories is a paying proposition. Cheese-makers are well aware of the heavy losses hitherto sustained through working with milk which is delivered in a slightly overripe condition, a quantity of this class of milk being received at all cheese-factories during the summer months. As pasteurization will entirely overcome this difficulty the saving effected in this direction alone is very considerable.

At different stages in the process of cheese-manufacture losses of fat are observed, but these losses are considerably decreased when the



TWIN PASTEURIZING PLANT IN A TARANAKI CHEESE-FACTORY.
Showing whole apparatus—receiving-vats, milk-pumps, regenerative heaters, and coolers.

milk is pasteurized. A number of tests have been made which show that the loss of fat in the whey is on an average 0.05 per cent. less with pasteurized than with unpasteurized milk. With pasteurization there is practically no loss of fat in the cheese-presses. The elimination of the various losses indicated proves, of course, that a greater yield of cheese per pound of butterfat can be obtained under the pasteurizing system of manufacture.

The improvement in quality, and consequent reduction in the amount of second-grade cheese manufactured, means a direct monetary gain to the dairy-farmer, as the value of second-grade cheese is in all cases $\frac{1}{4}$ d. per pound less than that of first-grade. During the past season 44,240 crates of second-grade cheese were shipped from various ports throughout the Dominion. Averaging the weight of each crate at 160 lb., this quantity of cheese at $\frac{1}{4}$ d. per pound represents a direct loss to the cheese-producers of £7,373, a sum almost sufficient to pay interest on the outlay necessary to install a pasteurizing plant at each of the 388 cheese-factories in New Zealand.

It will, of course, be evident that the full benefits of pasteurization cannot possibly be obtained unless the work is well and carefully carried on throughout. There are some points in connection with the working of the pasteurizing plants and manufacture of the cheese which require careful attention if the best results are to be obtained.

A temperature of 160° to 165° should be aimed at, and the machines in use are so well constructed that if reasonable care is exercised no difficulty will be experienced in maintaining an even temperature between these points. If the temperature of the milk be permitted to fall below 160° the injurious germs are not destroyed, and one of the chief benefits to be derived from the system of pasteurization is, of course, lost. On the other hand, if the temperature is allowed to rise much above 165° the casein-content of the milk is so injured that the curd obtained loses its cohesive properties to a very great extent. Such curd will remain more or less broken during the process of manufacture, and will result in a mealy-bodied cheese. Many of the faults found in some lines of cheese made from pasteurized milk have been directly traced to irregular heating of the milk. It will thus be apparent that the maintenance of an even temperature when pasteurizing is of the utmost importance.

The question of cooling the milk prior to adding the rennet is perhaps as important as that of heating. Instances have been observed where the rennet was added when the milk was at a temperature of 98°. In some cases this was due to the fact that the regenerator was operated considerably above its proper capacity, with the result that the quantity of milk passing over the cooler was so great that proper cooling was impossible. The remedy in such cases is the installation of another machine. It is almost impossible to properly cook a curd obtained from milk which was at a temperature of 95° to 100° at the time of adding the rennet. In working such material there is a considerable loss in yield, and the ultimate result is a weak-bodied inferior-quality cheese. The best results are obtained with a setting-temperature of 86° to 88°, and on no account should it be higher than 90°.

Several experiments have been carried out with a view to determining the amount of extra rennet, if any, required to coagulate pasteurized milk. The results of these experiments prove that practically no increase in the amount of rennet is required, as an equally good coagulation was in most cases obtained by using the same amount of rennet in pasteurized as in unpasteurized milk.

With careful attention given to the points mentioned, and the use of only a first-class starter, an experienced cheesemaker will find no difficulty in the manufacture of a high-grade cheese from pasteurized milk.

Perhaps the best indication of the popularity of this system of cheese-manufacture is to be found in the fact that, although prior to the season 1914-15 the pasteurization of milk for cheesemaking on a large scale was practically unknown in the Dominion, there are at present 141 of such pasteurizing plants in operation, and more are being installed. There is no doubt that the general adoption of pasteurization will be of the greatest benefit to the cheesemaking industry of New Zealand, and it may be confidently anticipated that in a very short time a pasteurizing plant will be considered a necessary part of the equipment of every cheese-factory.

In conclusion, it should be impressed upon dairy-farmers that although a pasteurizing plant may be installed at their factory the necessity for a clean, sound milk-supply is in no way lessened. Under no system of manufacture can the highest quality of cheese be obtained unless the milk is delivered in good condition.

TESTS WITH UNFRUITFUL PLUM-TREES.

THE experiments with unfruitful plum-trees, outlined in the March, 1919, *Journal*, have been continued in Mr. E. F. Sibeth's orchard at Clive Grange, Hawke's Bay. In order to further test the value of inter-pollination one silver-prune was transplanted in the centre of the greengage block, and one greengage was transplanted adjacent to the silver-prunes. During the flowering-period of the greengages, blossom wood of Pond's Seedling and Reine Claude de Bavay was placed in jars in two trees. One more colony of bees, making a total of six, was placed in the orchard. Mr. W. M. Rice, Orchard Instructor, Hastings, reports that the pruning, ring-barking, and root-pruning carried out the previous season, and detailed in the published report, had no effect on the crop whatever when compared with those trees not treated. The silver-prunes had little or no blossom this past spring, while most of the greengages had a fair amount of bloom. The value of interpollination was again confirmed. The crop throughout the block, other than under the influence of the introduced bloom, is nil. A good setting surrounds the Pond's Seedling wood, particularly in close proximity to the bottles, while a light setting surrounds the wood of Reine Claude de Bavay. The transplanting of the silver-prune into the greengage block, and *vice versa*, proved of no value, as the trees had little or no bloom.—*Horticulture Division*.

FRUIT COOL STORAGE.

EXPERIMENTS WITH APPLES AND PEARS.

G. ESAM, Acting Assistant Director, Horticulture Division.

THE export of apples from New Zealand having been stopped during the war owing to shortage of shipping-space, the local markets were called on to absorb the whole of the output from the orchards. This was made possible only by a large increase in cool storage, thereby greatly extending the season for marketing. Following up the indication given on page 344 of the *Journal* for December, 1918, the Horticulture Division undertook during last season comprehensive experiments in picking, handling, and packing fruit for cool storage in order to assist growers and the cool-storage companies to improve their working practice.

To get the best out of cool storage the fruit must be placed in store in the very best condition. A great variation—no doubt due to the different methods adopted by the individual growers in picking, handling, and packing the fruit for storage—has been noticed in the same variety when stored in the same chamber. The experiments certainly indicate that if growers will perform their portion of the business carefully and well the cool stores can be relied on to turn out an article in good condition.

The leading features of the experiments were as follows: To ascertain the best time to pick the leading commercial varieties for storage; to ascertain the best means of picking and handling the fruit to ensure a minimum of bruising; to test the effect on fruit of delay from a few days up to two weeks between the time the fruit is picked and placed in storage; and to ascertain if there is any advantage in wrapping the fruit or lining the cases with paper.

The experiments were undertaken in Hawke's Bay, and the fruit was placed in the cool stores of both the Hawke's Bay Fruitgrowers (Limited), and Apsey, White, and Co. (Limited). Arrangements were made with growers to purchase the whole crop from certain trees in their orchards, and this enabled two or three pickings to be made from the same trees. The fruit, with the exception of one variety, was stored in bushel cases, and the full test comprised some 280 cases.

As there are two distinct types of fruitgrowing lands in Hawke's Bay the tests were duplicated with fruit from trees grown on both classes of soil. For the purposes of convenience the two types will be referred to as the "hill country" and the "flat country" respectively. The former comprises the medium soils, such as found on the slopes of Havelock North, while the latter comprises the rich dark soils of the plains. Generally speaking, fruit grown on the plains has a tendency to grow larger and develop less colour than fruit grown on the higher country.

Shortly after the experiments were commenced departmental arrangements took the writer away from the district, and the work was carried

on by Mr. W. H. Rice, Orchard Instructor, Hastings, who took all records and supplied the notes on which this report is based. All dates refer to the year 1919.

STAGE OF RIPENESS AT WHICH TO PICK.

Apples.

There is a great tendency to pick early, so as to keep the number of windfalls down to a minimum. Throughout the picking tests the first picking corresponded with the main early picking in the district, and was tested against fruit picked from the same or similar adjoining trees a little later. In nearly all instances a second and third picking was made. The fruit was placed in the cool chamber the same day that it was picked. All pickings were taken out of store together, so that a fair comparison one against the other could be made.

The ideal condition in which to withdraw fruit from cool store is while it is still crisp and juicy and before it becomes dry and mealy. An effort was made to withdraw the fruit from store while it was in its best condition, or at about the average storage period for the respective varieties.

Gravenstein.—All fruit was taken out of store and examined on 28th April.

First picking (hill country, 25th January; flat country, 3rd February): Fruit was lacking in colour and inclined to have green tinge, pips only light brown. Larger fruits showed bitter-pit. All inclined to wither and show sponginess instead of ripening.

Second picking (hill country, 6th February; flat country, 12th February): Better colour than first picking. Much better stage for storage; very little sponginess when taken out of store. Crisp and juicy and not mealy after fourteen days. Traces of bitter-pit in all sizes.

Third picking (hill country, 12th February; flat country, 17th February): Best colour, more striped and attractive. Ready for immediate use from store, but did not keep as well out of store as second picking, particularly from the orchard on the flat. Less bitter-pit in this picking.

The average loss of weight in storage was $1\frac{1}{2}$ lb. to $1\frac{3}{4}$ lb. per bushel case. The second picking stored the best. The third picking was more attractive-looking, but went soft and mealy very quickly out of store. The wrapped fruits gave the best results.

Cox's Orange Pippin.—Taken out of store and examined on 14th May. Test was made on fruit from both the hill and flat country.

First picking (25th February): Fruit lacked colour and was unattractive; about 75 per cent. developed bitter-pit, particularly in fruit over $2\frac{3}{4}$ in. Inclined to shrink and went spongy after seven days out of store; even the best specimens shrank rather rapidly.

Second picking (6th March): Yellow body-colour developed, but blush and stripe not pronounced. Less bitter-pit than first picking, but much worse in fruit from the flat country. Larger fruit inclined to mould in the eye, but on the whole texture was fairly firm when taken from store.

Third picking (18th March): Good samples. Blush and stripe predominated, particularly on the hill country. Smaller fruits in best condition from hill country. Fruit from flat country ripened quickly during latter part of storage. Larger sizes went musty, though of good appearance. Some of the medium-sized fruit went brown towards the core after four days out of storage. Although the weather was clear and warm at picking, some 10 to 12 per cent. from both orchards showed mould in the calyx, which did not penetrate to the core.

There was not much difference between the second and third pickings, which were a decided improvement on the first. For long storage the second picking would be the best, but for short storage the third picking would turn out the best-quality fruit in good condition. Well-matured, medium-sized fruits stored the best.

Jonathan.—Taken out of store and examined on 27th May.

First picking (11th March): Well-coloured fruits in this picking kept well, while the greener and less matured fruits showed a marked shrinkage, particularly those that were russeted with bordeaux. Some well-coloured fruits that should have been picked but were allowed to remain on the trees another nine days became soft and mushy under storage.

Second picking (20th March): This picking developed surface bruise rather badly. Went off rather quickly out of store, only the smaller-sized, well-coloured fruits remaining firm.

Third picking (27th March): Was rather a mixed lot, and no reliable comparison could be made with the fruit from the flat country, which was poor in colour. Fruit after fourteen days out of storage went soft and mushy.

The average loss of weight per case was $1\frac{1}{4}$ lb. It was noticeable no bitter-pit or Jonathan spot developed in storage. It was apparent that fully developed and coloured fruits should be picked early for storage, and not left on the tree to develop high colour, as they then go mushy when stored. The smaller-sized fruits stored the best.

Dunn's (Monroe's) Favourite.—Taken out of store and examined on 20th June.

First picking (26th February): Poor colour and developed up to 15 per cent. of bitter-pit in storage, though none appeared to develop after the fruit was taken out. Fruit shrivelled very badly out of storage, and became practically useless fifteen days after removal. Bruised specimens kept fairly well in store, but decayed rapidly when taken out. Fruit from the flat country affected in early stages of growth by frost kept very poorly.

Second picking (hill country, 12th March; flat country, 8th March): The former lot had rather more colour than the first picking, yet behaved very similarly under storage. Fruit from the latter country was a poor lot generally and badly frosted in the early stages of development. Sound specimens shrunk less out of storage, and on the flat country this picking proved the most satisfactory.

Third picking (hill country, 31st March; flat country, 19th March): On the hill country this picking kept best of any lot out of store. It was better matured and shrunk less. Although the third picking on the flat country was better coloured than the former two pickings it went mealy after seven days out of store.

Unlike the other varieties, the Dunn's from the two classes of soil did not behave in a similar manner. Frost injury on the flat country may have caused the variation. Frosted fruits clearly proved no use for storage purposes. The average loss of weight in storage was 2 lb. per case. Bruised fruit stored well, but decayed quickly out of store. Fruit ripened on the tree became mealy soon after withdrawal, while underripe fruit shrank very badly.

Delicious.—Taken out of store and examined on 19th August. The fruit on the flat country lacked colour compared with the hill fruit. This can be attributed to some extent to the trees on the flat being denser than those from which the fruit was taken on the hills. The exposed upright arms on the flats showed up to 75 per cent. of colour.

First picking (25th March): Kept in excellent order and ripened up well. Fruits over 3 in. bruised more rapidly than smaller sizes. Considerable mould developed in the eye, though the fruit was perfectly dry when picked and stored. Fruit ready to pick at this picking, but allowed to remain on the trees till 9th April, developed very rapidly when taken out of store and became rather mealy after fourteen days. The first picking proved the best, particularly from the hill country.

Second picking (9th April): Although very similar to the first picking, the fruit was perhaps softer and bruised more easily. Slightly better colour than the first picking.

Third picking (16th April on the hill country, and 23rd April on the flat country): While the colour was deficient in this picking the fruits proved more matured and riper than is advisable to store, although at picking-time there was no high colour to indicate ripeness. This picking was ready for use immediately out of store, but soon afterwards went mealy.

The loss of weight in store averaged 2 lb. per case. The highly coloured fruit in the earlier pickings stored much better than the greener specimens. Later pickings not so satisfactory, while overripe fruit became mealy. Bruises did not decay until removed from store, except with the later pickings.

Sturmer.—Taken from store and examined on 6th October.

First picking (7th April): Well-coloured specimens stored well, but all other fruit shrivelled badly and thus proved unsuitable for storage.

Second picking (15th April): Again the undeveloped fruit shrank very badly; only the better-coloured fruits stored well.

Third picking (23rd April): The blush and ground colour was fairly well developed. Fruit was more subject to bruise than the earlier pickings. The smaller fruit was not so inclined to shrivel as the earlier pickings. On the whole this picking was inclined to be overripe when removed from store.

This variety demonstrated the direct advantage of grading the fruit for storage, selecting the better-coloured fruit from the earlier pickings for long storage, and using the less-developed fruit for shorter storage. Average loss of weight per case, 1 $\frac{3}{4}$ lb.

Dougherty.—Taken from store and examined on 17th November.

First picking, 22nd April; second, 3rd May; third, 11th May: There was no noticeable distinction between fruits of equal maturity

in the three pickings. In the earlier pickings fruits with undeveloped ground-colour were the only ones inclined to shrink. Fruits allowed to remain on the trees till nearly ripe were more bruised and mealy when removed from store. The fruit from the orchard on the flat country was russeted, and it was noticeable that this class of fruit appeared to shrink from this cause. Average loss of weight per case, $2\frac{1}{4}$ lb.

White Winter Pearmain (McMahon's White).—This variety is doing particularly well at the Arataki Horticultural Station. One picking was made on 16th April, and the fruit graded into two stages of maturity according to the ground-colour. The fruit stored well up to 15th September, which proved the maximum storage period for fruits well matured when picked. Those not quite so advanced at picking-time held up better after removal from store. Compared with Sturmer this variety ripens to a similar condition in storage fully three weeks earlier, and would thus provide a distinct marketing-period.

Summary for Apples.

Fruits which had attained that stage of maturity which is denoted by the distinct change of ground-colour proved most satisfactory to handle and cool store, while fruits which had attained full size but did not show the change of ground-colour were inclined to shrivel and go sleepy, and, although they ripened, the resultant colour was below standard for the variety. Fruits which were well advanced and showed a high percentage of ground-colour, though certainly the most "fancy" fruits for early sales, went mealy when stored for the average period of the variety, and collapsed quickly out of store, as well as being more susceptible to bruising.

To get the best out of cool storage the necessity of going over each tree several times and selecting only those apples with a distinct change in the ground-colour was demonstrated. For storage it is inadvisable to allow apples to attain a full blush on the tree once the change in the ground-colour has taken place. Russeted apples should be stored separately and withdrawn earlier than the clear-skinned fruit.

Pears.

Three varieties of pears were picked and stored under similar conditions to the apples. Two early varieties and one medium late were used for the test. Again an effort was made to gauge the best time for picking.

Williams Bon Chrétien.—Three pickings were made from an orchard on the flat country, on 7th, 19th, and 24th February respectively. All the fruit was taken out of store and examined on 2nd April. No marked difference in the maturity of the fruit could be observed at this stage, but as the fruit ripened and became ready for sale a distinction between the various pickings was noted. The first picking was fairly good up to fourteen days, then became soft and puffy. The second picking was good up to fourteen days, then soft and mellow. The third picking showed bruise badly, and after about six days a skin-rot developed.

The average loss of weight per case was $\frac{3}{4}$ lb. A certain amount of scald developed on all the pickings, but it was less evident on fruit which was pre-cooled.

Louise Bonne of Jersey.—Four pickings were made from an orchard on the flat country, on 14th and 21st February and 3rd and 10th March respectively. All fruit was taken out of store and examined on 29th April.

First picking shrivelled very badly at the stem end—even the best specimens. The average loss of weight was 3 lb. per case.

Second picking did not shrivel to such an extent as the first picking, but still shrivelling was considerable. There was a marked difference in the amount of bruise, which indicated that careful handling becomes more important as the fruit matures. Average loss of weight, $1\frac{1}{4}$ lb. per case.

Third picking was well-developed, good-coloured fruit. Texture was firm and flavour fair, which was lacking in the two earlier pickings. Bruise developed rather badly in store. Average loss of weight, $\frac{1}{2}$ lb. per case.

Fourth picking was most satisfactory. It was of good colour, full flavour, and very firm texture. There was no noticeable shrinkage, yet the loss of weight averaged 1 lb. per case. Any picking or packing bruise showed up very quickly when taken out of store.

This variety showed no skin-rot, so noticeable in Williams. The first picking can be said to be valueless for storage. The second picking was leathery in seven days after withdrawal from store. The third picking was soft and mellow after seven days, but became dry in twelve days. The fourth picking was even better, being sweeter at seven days, but had little flavour after the twelfth day.

Winter Cole.—Three pickings were made from one orchard, on 25th March and 1st and 10th April respectively. They were taken out of store on 4th August, the average loss in weight being $1\frac{1}{2}$ lb. per case. As no appreciable difference was observed when examined in store from time to time the fruit was kept in store until it was fully ripe, and was even then a very even lot throughout. A slight shrivelling was observed only in a few immature fruits.

HANDLING TEST.

A comprehensive handling test was conducted in the scheme of experiments, and, as would be expected, this factor proved to be a very important feature in connection with cool storage of fruit. To enable a reliable comparison to be made all the foregoing varieties of apples and pears came under the scheme, and as far as possible the test was carried out with each picking of the variety. Not only was a report made on the handling at the time the fruit was taken out of the store, but it was marketed in the usual manner, and a further report was made by an independent official at its destination. The handling test comprised the following methods:—

(1.) Fruit picked carefully in the usual manner into a picking-bag, then emptied in the ordinary way into the orchard case, and the case then lightly shaken to settle the fruit. The case was conveyed in this manner to the central packing-shed. It was then topped off and a lid put on.

(2.) Case topped off and lid nailed on in the orchard, otherwise the same handling as (1).

(3.) Fruit picked carefully into picking-bag and emptied carefully into bulk case or orchard case. Fruit was then lightly packed from this case into another case on the diagonal or pocket-pack method with wood-wool top and bottom. (Note.—This method could have been improved by using a grading or packing table under the shade of the trees.)

(4.) Fruit picked and packed on the diagonal or pocket-pack method direct from the tree into case with wood-wool top and bottom.

Fruit handled under each method was taken to the cool store in the same conveyance and placed in store together. (1) and (2) were packed for market after they were taken out of store. (1) represented the usual method adopted in the district of picking and conveying the fruit in open cases to the central packing-sheds, which are run in conjunction with the cool stores, much of the fruit being usually placed promptly into the cool chambers and graded and packed when taken out.

The following observations were made regarding results under the several methods :—

(1.) Fruits in all pickings and stages of development showed a very marked increase in bruising over (3) and (4), due to the fruit rolling and settling down in the case during transit. Bruising was particularly noticeable in Gravensteins. Even such a good cool-store variety as Sturmer bruised badly under this method. The same bruising on pears was also evident.

(2.) Very similar condition to (1). Eight or ten fruits could be placed in each case when they arrived at the store, even though a little lid bruise showed on some fruits, showing that the cases were well filled in the orchard.

(3.) This method proved satisfactory, and showed little or no handling-bruise except in specimens well advanced in maturity. A marked improvement over (1) and (2), even with Sturmers.

(4.) Proved the most satisfactory and showed least amount of handling-bruise, but not sufficient improvement on (3) to warrant commercial practice except with fairly ripe fruits intended for short storage.

This portion of the experiments emphasized the great importance of handling the fruit carefully and doing everything possible to ensure it being placed in cool store in the best possible condition. Much damage was done to fruit loosely packed in cases and carted in this condition to the cool stores. The advantage of the orchard pack was very evident both with apples and pears.

COOL STORING PROMPTLY AFTER PICKING.

A further series of tests was made with the same varieties to observe the effect of promptly placing fruit in cool store after it is picked. The following formed the basis of the experiments :—

(1.) Fruit was kept in closed cases in the shade of the trees for various periods, ranging from five to seven days with early varieties and up to twenty-one days with late varieties.

(2.) Fruit was kept in packing-shed under same conditions as (1).

(3.) Fruit was delayed in closed cases in the orchard for various periods, then further delayed in the packing-shed.

(4.) Fruit was allowed to remain exposed to the direct rays of the sun for short periods after being picked and put into orchard boxes.

Check cases of fruit, picked and packed from the same trees under identical conditions but placed promptly in cool store, were used throughout for comparison.

A decided advantage in placing fruit promptly in store was forcibly demonstrated. In the earlier pickings with each variety even a short delay caused the fruit to shrivel and shrink and become leathery, which was intensified the longer the fruit was delayed before being put into store. With the later pickings, where the fruit was more matured, the delay hastened ripening in each variety. It was observed that this class of fruit was inclined to develop decay where bruised, and the decay appeared to spread in storage, while similarly bruised fruit which was placed promptly in storage developed decay only when removed from store.

The loss of weight was greater in fruit that was delayed before being placed in store. Dunn's (Monroe's) Favourite showed a loss of $4\frac{1}{2}$ lb. per case. With Delicious the delay hastened ripening rather than caused shrivelling, while with Sturmers shrivelling was more pronounced. With pears, particularly Williams, delay proved very injurious.

No noticeable difference could be observed in the method of delay indicated in (1) and (2). If anything, the double delay in (3), even for the same period as (1) or (2), proved more detrimental. Codlin-moth grubs were found in (1) cases delayed in the orchard.

Exposure to the sun's rays (4), even for a couple of hours, proved so injurious to the top layers in the cases of the early varieties that it was not continued.

WRAPPING FRUIT.

Apples that were wrapped and packed before being placed in cool store were of brighter general appearance and colour than similar unwrapped fruit from the same trees placed in store at the same time. This was noticeable with all varieties; even the early Gravensteins and the long-keeping Sturmers behaved alike. Although the wrapped fruits were riper they retained firmness of texture equally with the unwrapped. Wrapping did not influence or retard the development of bitter-pit, and its effect on decay could not be determined, as all the fruit used throughout the wrapping test was very carefully handled.

The effect of wrapping the different varieties of pears was inconsistent. Nothing could be made of the Williams pears; all except one wrapped case were a failure. The wrapped Louise Bonne of Jersey pears appeared to develop a little more colour than the unwrapped, while wrapping the Winter Cole pears delayed their ripening.

Cases lined throughout with a double thickness of newspaper showed no marked variation from similar cases not so lined, but the fruit lacked the brightness of skin so evident in that which was wrapped singly.

INJURIES TO FRUIT.

Apart from the bruising already dealt with in connection with the handling test stem-punctures were prevalent on fruit that was not

carefully handled. The loss of the stem did not cause decay unless the tissue of the fruit was torn. Fruits affected by frost in the early stages of their development shrunk badly when compared with those not affected.

HILL COUNTRY AND FLAT COUNTRY.

As already indicated in the early part of this report, fruit grown on the rich soil of the flats was tested against fruit grown on the medium soils, such as the slopes of the Havelock Hills. The orchards on the plains were more affected by frost than those on the slopes, and as a result the crops were very inconsistent and generally light. Although a special effort was made to select trees on the flats and slopes carrying about the same crops it was found almost impossible to do this, as the fruit on the richer lands of the flats was inclined to oversize, owing to the lightness of the crop. The results were inconsistent, and no comparison of value could be made.

CONCLUSION.

The results of the experiments clearly demonstrate the important part the orchardist has to take in the ultimate success of the cool storage of fruit. Only by strict attention by the grower to picking the fruit at the right stage of maturity, handling it in a careful manner, keeping it out of the sun once it is picked, the elimination of bruising during conveyance to the store, and placing the fruit promptly in store after it is picked can success be assured. If careful attention is paid to these details the stores can then be expected to do their part of the business in an efficient manner. It certainly appears evident from the experiments that a good many faults attributed to cool storage lie in the unsatisfactory condition in which fruit is often placed in store.

It is proposed to continue the experiments this season. The stage of maturity at which the fruit is picked and wrapping against non-wrapping will be the leading features. Two pickings of apples and three of pears will be tried, but the fruit from each picking will be graded into two grades for maturity. The handling test will be confined to grading and packing in the orchard or the orchard packing-shed, as against conveying the fruit in orchard boxes to the stores and then grading and packing before storing. Russeted fruits from the same trees will be stored separately from the clean-skinned fruits. One or two additional varieties of pears will be tested.

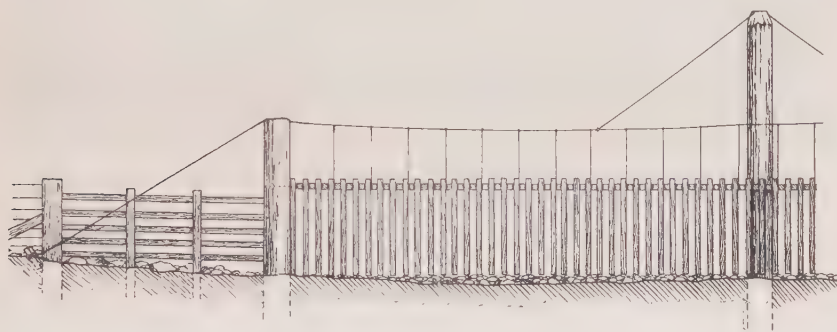
The success of the experiments here recorded is in no small measure due to the personal efforts of Mr. Rice, and to the co-operation and valuable assistance rendered by the managers of the two cool-store companies at Hastings.

Forestry Articles.—Under the heading "Dissemination of Forestry Information" the last annual report of the Forestry Department, after commending the work of the Forestry League, remarks, "The Rev. J. H. Simmonds and other observers have at various times contributed to the *Journal of Agriculture* valuable articles on different exotic trees grown in New Zealand, and it is to be hoped that these enthusiasts will continue to publish the results of their observations, which are of much value to the Forestry Department and private tree-growers."

A GOOD TYPE OF FLOOD-GATE.

ON page 272 of the November *Journal*, in an illustration of the Makaretu River, was shown a flood-gate constructed on a very practical and efficient design by Mr. M. Paulsen, of Takapau. Particulars of this flood-gate, and of smaller ones on the same principle, are given by Mr. Paulsen in the following note:—

The flood-gate is about 6 chains long and in flood-time swings out the whole length in a body, the wire on which the battens are strung not being fastened to any of the posts in the centre or at the ends. All the battens are bored with a $\frac{1}{2}$ in. bit, then threaded on to a cable of about $\frac{3}{8}$ in. gauge. Another cable or wire runs from post to post



BANK END OF LARGE FLOOD-GATE.

The flood-gate can be extended (on right), with posts at intervals, to any reasonable length, according to the width of the stream.

3 ft. from top. From this cable hang down wires hooked on to the wire holding the battens. The cable is anchored at both ends, then put up on top of a post at each end at the height required, above the highest flood-marks. There is also another wire over the top of the posts, fastened in the middle of each span. This takes the weight off the centre of the span, and can always be tightened up without much trouble. As the river rises the battens float on top—however high the water. Only extremely large branches are liable to catch. This flood-gate has been erected six years, and has required no repairs. The down-wires are left long enough to allow them to be raised or lowered according to any alteration in the river-bed. The battens are of white-pine, 3 in. by 2 in., and 5 ft. in length. To make the flood-gate lighter a short piece is bored and placed in between each batten on the same wire, leaving the battens about 4 in. apart. The piles are 12 in. by 12 in., totara, driven 8 ft. into the ground. I got them driven while the bridge was being built. Previous to the erection of this flood-gate

the fences used to be washed down at every flood, and caused great expense and endless inconvenience during busy seasons.

I also make flood-gates on the same principle for smaller streams. Where there is only one bank available, either a railway-iron or high post is used to get the height. In other cases no posts are used, the



SMALL FLOOD-GATE.

The dark post on right is a railway-iron. In this flood-gate there are two overhead wires, one above the other, connected by down-wires at intervals.

carrying-wire being fastened to a tree on each bank. Four-foot or five-foot logs have passed under these gates without doing damage. The battens must rest on the ground, otherwise in windy weather there is too much strain, and openings are apt to be left where stock can get through. Sometimes I put a wire on the down-stream side of the battens, stapled on to keep them in their place.

Milk-products Investigation.—Mr. W. Dempster, of the Dairy Division, returned this month from his visit to America and Europe. Reports on his investigations will be published in due course.

Instruction in Pig-keeping.—This important branch of live-stock husbandry, which has been declining in New Zealand for some years past, will be dealt with in future by the Department through a special Instructor in Pig-keeping, under the Live-stock Division, Wellington. The position has been filled by the appointment of Mr. K. W. Gorringe, who is well known as an extensive pig-raiser in Taranaki, Waikato, &c., and brings a large fund of practical experience to his new duties. He will travel in the various country districts.

TESTING OF PUREBRED DAIRY COWS.

CERTIFICATE-OF-RECORD LIST FOR DECEMBER.

W. M. SINGLETON, Assistant Director of the Dairy Division.

IN the appended list, comprising all available records completed in December, are shown the performances of a number of cows and heifers the larger proportion of which commenced their lactation period later in the milking season than was the case with the animals appearing in recently published lists. The present records represent the production of quite a number of yearlings in the junior two-year-old class. When the age is considered it must be conceded that many of these productions are very creditable.

JERSEYS.

From the point of view of maximum production and margin over requirement to qualify the yield of Hill Belle merits special reference. She is a daughter of Eminent's Fontaine (imp.), who now has twenty-one C.O.R. daughters. Her dam was Silver Light, a daughter of Starlight, and therefore half-sister to Sabeen III, who has a C.O.R. for 625.38 lb. butterfat. Silver Light is also half-sister to Starlight II, the sire of Floss V, who has a C.O.R. for 621.40 lb. butterfat.

FRIESIANS.

Queen Colantha Cadilac has the distinction of being the only animal in this list in the 600 lb. butterfat class. She was tested as a senior two-year-old, and is by a son of King Segis Wild Rose Homestead from Friesland Park Colantha Cadilac, a daughter of Dutchland Colantha Cadilac (imp.). Queen Colantha Cadilac is a line-bred cow, since King Segis Wild Rose Homestead appears as her grandsire on her sire's side and as great-grandsire on her dam's side. Her pedigree shows 87½ per cent. from North American strains, including Colantha Johanna Lad. The three nearest dams of Queen Colantha Cadilac have each been on test and have produced well.

Another good record in the senior two-year-old class is that of Martha Johanna Rue. She traces entirely to North American strains, being daughter of Mutual Piebe of Rock (imp.) from Martha Elgin Pauline II (imp.). Her sire and dam were both sired by Mutual Piebe de Kol, who has produced many high-record daughters, including Mutual Pearl of Rock, who in the ordinary course will shortly complete the calving requirement for a C.O.R. for 903.44 lb. butterfat.

In the senior four-year-olds Willem's Koe de Kol has annexed a very creditable record. She is by Colantha Sir Winana (imp.), and thus traces through his sire Colantha Johanna Lad to the high-record cow Colantha IV's Johanna, who was at one time the world's leader with a credit of 998.26 lb. butterfat.

MILKING SHORTHORNS.

The production of Pitlochrie Queenie will attract attention to her breed. The herd-book supplies no pedigree for this cow, consequently further comment is impossible.

RECORDS COMPLETED DURING DECEMBER, 1919.

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.			
				Days.	Milk.	Fat.	
JERSEYS.							
<i>Junior Two-year-old.</i>		Yrs.	dys.	lb.	lb.	lb.	
Melia Ann's Rose ..	W. T. Luxton, Waitara	1	350	240.5	365	7,644.4	467.95
Aster's Fair Lady ..	James Nicolson, Kau- pokonui	2	83	248.8	364	9,577.0	457.31
Koro Koro Silky ..	R. W. Southee, Kiwitea	1	329	240.5	365	8,895.5	452.10
Golden Fern's Queen	T. Dixon, Masterton..	2	3	240.8	365	7,727.6	441.86
Miro Meadows Fay	R. W. Southee, Kiwitea	2	39	244.4	365	7,773.4	438.17
Twinkle	E. B. Eagle, Carterton	1	313	240.5	365	7,822.0	425.58
Aureola	V. W. Nowell, Hawera	1	336	240.5	365	7,174.4	408.07
Copper Coin of Wood- stock	H. Livingston, Kiwitea	1	327	240.5	365	7,256.5	402.52
Miro Meadows Dot ..	A. A. Ward, Tariki ..	1	356	240.5	365	6,536.4	395.85
Middlewood's Molly	H. Livingston, Kiwitea	1	308	240.5	365	5,303.9	372.43
Bonnie Queen ..	E. B. Eagle, Carterton	2	15	242.0	365	6,897.7	364.23
Ivy Fox	F. E. Day, Tamahere	1	336	240.5	365	6,325.9	353.86
Oakland's Patchless	J. Hartstone, Te Ko- whai	2	59	246.4	265	5,321.7	321.13
Jerseydale's Queen Bess	J. Pettigrew, Pihama	2	10	241.5	363	5,072.0	296.50
Delight of Willowbank	Ranford Bros., Strat- ford	1	345	240.5	312	5,624.4	294.45
<i>Senior Two-year-old.</i>							
Trelawny Clematis ..	Thomas Church, Te Rapa	2	352	275.7	357	7,751.8	340.86
Flora's Silverlocks ..	J. G. Harkness, Wel- lington	2	107	251.2	308	5,348.3	333.04
<i>Three-year-old.</i>							
Hill Belle	A. C. Lovelock, Wood- ville	3	295	306.5	305	9,355.2	578.27
Aster's Vanity ..	James Nicolson, Kau- pokonui	3	5	277.5	305	8,234.8	473.00
Waipiko Christina ..	L. M. Barriball, Waiuku	3	353	312.3	278	7,100.1	446.40
Beachland's Rose ..	A. C. Lovelock, Wood- ville	3	30	280.0	203	6,801.2	353.77
Disdain's Twilight ..	F. Gough, Awakeri ..	3	118	288.8	201	4,746.4	293.91
<i>Four-year-old.</i>							
Olga's Sweetheart ..	R. J. Linn, Normanby	4	64	319.0	273	7,282.6	432.21
Freesia Day	F. Gough, Awakeri ..	4	54	318.9	274	7,286.0	367.78
<i>Mature.</i>							
Kairona	R. C. Leach, Woodville	5	11	350.0	357	7,439.45	458.65
Gowan	H. Livingston, Kiwitea	7	81	350.0	365	7,224.0	403.69
FRIESIANS.							
<i>Junior Two-year-old.</i>							
Lakeview Princess Kroons	C. A. Fawcett, Clevedon	2	113	251.8	365	12,625.4	384.26
Colantha Gift ..	T. W. Crossen, Selwyn	1	357	240.5	259	8,612.3	275.95

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
FRIESIANS—continued.						
Senior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Queen Colantha Cadillac	W. I. Lovelock, Palmerston North	2 255	266·0	365	15,887·5	614·97
Martha Johanna Rue	W. Barton, Featherston	2 286	269·1	364	14,880·1	509·11
Senior Four-year-old.						
Willem's Koe de Kol	W. I. Lovelock, Palmerston North	4 219	335·4	365	15,023·2	556·49
Mature.						
Oakwood Rambler ..	W. D. Hunt, Invercargill	5 274	350·0	345	15,035·8	482·08
MILKING SHORTHORNS.						
Two-year-old.						
Rushmere Darling ..	W. H. Brewster, Feilding	2 8	241·3	365	6,518·1	259·32
Mature.						
Pitlochie Queenie ..	D. H. Kilgour, Feilding	*	350·0	365	14,217·9	584·61
Lillydale Violet ..	R. C. Leach, Woodville	*	350·0	362	9,705·65	466·75
Blossom ..	J. C. Hearsey, Longburn	*	350·0	365	11,134·6	457·73
Monavale Dairymaid	H. W. Giles, Monavale, Cambridge	*	350·0	365	12,392·7	452·84
Corriblea Tulip ..	M. Creaven, Taikorea	*	350·0	365	10,673·6	432·17
Parrot I of Myrtlene	A. Feierabend, Dannevirke	*	350·0	317	10,092·9	389·47
Woodlock Maid ..	J. R. Anderson, Foxton Line	5 21	350·0	291	9,712·2	382·71
Fussie I of Myrtlene	A. Feierabend, Dannevirke	4-5	350·0	315	8,428·6	374·72
Nancy I of Myrtlene	A. Feierabend, Dannevirke	*	350·0	319	9,250·5	364·47

* Mature.

NOTE.—A supplementary list, completing the records for 1919, will be published next month.



THE FRUIT INDUSTRY OF NORTH AMERICA.

CO-OPERATION AND STANDARDIZATION.

J. A. CAMPBELL, Assistant Director of the Horticultural Division.

CO-OPERATIVE ORGANIZATION.

THE fruit industry of Canada and the United States, particularly in the western areas, was never in its history more prosperous than at the present time. This prosperity is largely due to the co-operative movement, which although not new, particularly as regards California, has been brought to a successful issue in most instances only during the last few years.

For twenty years previous to this era of successful co-operation the lot of the Californian fruitgrower was a precarious one, fluctuating according to season, but the general tendency was from bad to worse. The growers were largely at the mercy of the eastern buyers, who, through lack of organization among the producers, were in a position to largely control the means of transportation. The more progressive growers realized early in this period that relief could be found only in co-operation, consequently such societies were formed from time to time, but with one exception they invariably failed through one cause or another, such as inexperience, outside influences, want of loyalty on the part of members, lack of economy, &c., and went out of business in the course of one or two seasons. Each failure naturally increased the difficulties of subsequent efforts.

The exception referred to was the present California Fruitgrowers' Exchange, an organization brought into existence some sixteen years ago in the interest of the citrus industry of California, and now the oldest and undoubtedly the largest and most successful fruit-industry co-operative concern in America. The object-lesson taught by this association, together with the absolute necessity for relieving the disastrous position into which the industry generally had fallen, were instrumental in bringing about the more recent and successful movement in co-operation. At the present time such societies are to be found in practically every fruitgrowing district of any consequence in western North America. The majority are undoubtedly highly successful, and are growing stronger every year. Although they vary considerably in detail the fundamental principles governing possibly nine-tenths of them are based on those of the California Fruitgrowers' Exchange.

Practically the whole of the co-operative societies are formed on a non-profit-making basis. All the expenses of running the concern are derived from the fruit handled, and all the profits are returned to suppliers *pro rata*. A fixed rate of interest (7 or 8 per cent.) is usually arranged at the outset to be paid on all money in the form of shares held by the company, but this does not always apply. In cases where shares are held only by suppliers, and the number fixed on the acreage basis and paid by a case-levy on all fruit supplied, there is little to be

gained by paying out interest, to furnish which a heavier tax must be placed on the recipient's own fruit. This is now the popular means of financing such concerns.

In cases where shares are taken up regardless of the quantity of fruit supplied by the shareholders, and particularly in cases where the association packs fruit for growers other than shareholders, the payment of interest is, of course, necessary. These organizations are established under two distinct heads, and may be termed "complete" and "incomplete," each of these being divided into two classes.

The "complete" organization is one that packs and sells the fruit of its members. This is usually done through a chain of comparatively small associations, finally uniting in the form of a selling organization. The functions of the smaller associations are to prepare and pack the fruit for sale. Each one is complete in itself, the board of directors of the selling organization being elected from the directors of the whole. At the same time, although directly connected in this way, the selling organization is quite distinct from a legal standpoint. Such selling organizations usually become what are practically very large co-operative wholesale stores buying at advantageous rates practically everything required by its members.

Where such trading is done, however, the principle usually observed is not to directly undercut local merchants, but to fix a price that will leave a fair margin of profit, and then to notify the merchants of the prices at which the company intends doing business for the year. At the end of the year all profits made in the different departments are rebated to each member in accordance with the amount of his purchases through the company. The California Fruitgrowers' Exchange, the Okanagan Fruitgrowers' Union (British Columbia), and others operate in this way.

Class two of the complete organization is the co-operative concern which assembles, packs, and sells the fruit supplied by its members, much in the same manner as our co-operative societies in New Zealand. It is generally recognized, however, that this class is the most difficult to carry on successfully unless it is undertaken in a large way and the supply of fruit handled is sufficient to keep the overhead expenses, such as management, agency connections, advertising, &c., within reasonable limits.

The "incomplete" organization is one that is formed for the purpose of grading, packing, and preparing its fruit for sale only, and which then hands it over to an entirely separate concern for purposes of sale. Notable examples of this class are the Cashmere, Peshastan, Entiat, and Spokane Fruitgrowers' Unions in the western United States. Each of these concerns handles from half a million to over a million cases of fruit and sells exclusively through the Nor'-west Fruit Exchange, a proprietary concern with headquarters at Seattle.

The Nor'-west Fruit Exchange is the largest selling organization of deciduous fruit in North America. Its selling-charge is 10 cents per case, and out of this it maintains paid agents throughout practically the whole of North America.

The second class is an organization made up of fruitgrower shareholders and established for selling purposes only. It has nothing to do with packing, other than to employ inspectors to check the packing and to see that its members pack according to the State or its own

standard requirements. This form of association buys and sells and rebates all profits to its members in the same manner as the first.

In Canada commercial fruitgrowing is treated as a Federal Government matter, and the formation of co-operative associations is assisted by a grant of two-thirds the amount subscribed by the growers. In the United States, although strong Federal Government encouragement and support is given, it is mainly an individual State and county matter, and no financial assistance is afforded in the formation of such concerns. In some instances strong financial associations, such as the Shookum Packers' Association, advance money at a low rate of interest for the establishment of buildings and machinery to newly formed societies which affiliate with that association.

Economy or, rather, guarding against extravagance is the first principle in the formation of a co-operative concern. Commitments beyond the proposed company's capacity to meet within a reasonable time are avoided as far as possible in all cases, but particularly so where the supply of fruit to be immediately handled by the company is limited. Indebtedness for buildings and other equipment to meet prospective developments is not incurred until the company has been well tested and the prospective developments become an actual reality.

The general procedure in the formation of a company or packing association is for a number of growers to meet and decide the general lines on which the organization should be formed and guarantee the preliminary expenses. A canvass of the district is then made to ascertain the support and the correct estimate of the fruit the concern will have to handle. The formation of the company is then proceeded with on this basis. The capital is fixed and articles of association drawn out. A reasonable charge per case for the work proposed to be done by the company is fixed. An estimate of running the company is made, including interest on cost of buildings and plant, salaries, wages, &c. This is divided by the number of cases to be handled, and if the result is more per case than the price fixed some pruning is done; this is usually in the direction of reducing the packing-shed accommodation.

Central packing is generally considered to be the ideal method of handling fruit, and it is continually growing in popularity; but where State packing-standardization laws exist it is not held to be absolutely essential. At any rate, in cases of limited resources such as previously referred to it is considered advisable to utilize to a more or less extent the existing orchard facilities and labour rather than run the risk of unduly embarrassing the company at the outset. As the company progresses the additional facilities are provided.

Shares are issued on an acreage basis. These vary, but usually range from six to ten 10-dollar shares per acre. A small amount per share may be paid on allotment, but the remainder is paid by the deduction of a fixed amount—usually 2 cents per case—put through the company on account of the shareholder. At the same time each shareholder signs a certificate termed a "grower's note." This certificate is a very binding agreement relative to the shares held, and is accepted by the banks as collateral security. All further developments of the company are financed on the case-tax basis, but are undertaken only with the consent of the shareholders.

The loyalty of members is a very important factor in the success of a co-operative company. This is recognized, and a rather stringent

agreement is drawn up and signed by each grower. The aim of the American co-operative concerns, however, is not to bind their members against their will, but by the merit and efficiency of the company to make it very much in the interest of the member to remain an active supporter. In pursuance of this policy the agreements referred to are terminated at the end of each season. There are two months between seasons during which a member may, by giving written notification, arrange to dispose of his fruit outside of the company. If no such notification is made during the recognized period the agreement is automatically renewed for another year, in which case all the penalties provided are strictly enforced if occasion arises.

STANDARDIZATION.

All concerned in the American fruit industry are agreed that the business could not possibly have reached its present extensive and prosperous position had it not been for the stabilizing effect of the standard-packing laws. There are at least four grades of apples taken from a tree—first, second, and third grade, and culls. Without standard grading a buyer could not tell, short of personal inspection of each case, which of these or what percentage of each he was buying; consequently trade in a large way would be considerably hampered, or the buyer, to protect himself, would offer much less than the possible worth of the fruit. With standard grading, however, a buyer can safely buy on grade and variety without having seen the fruit at all.

Standard grading and packing operates throughout the whole of Canada. In the United States it is not yet universal, but all the western and north-western States have adopted State standardization laws. These apply to all packers of fruit for market, ample exception being made under what are termed domestic and jumble-pack provisions.

Packages in which fruit is allowed to be sold have also been standardized. Packages have been standardized for the whole of Canada, and all the western part of the United States has adopted more or less similar packages. The standard apple-box, 10½ in. by 11½ in. by 18 in., applies throughout Canada, also in the States of Washington, Oregon, Ohio, Montana, California, and possibly Arizona.

NOTE.—Mr. Campbell returned last month from his visit to America. It is intended, as soon as available, to publish in bulletin form a detailed report covering the whole of his investigations. In the meantime various features, such as the subject of the foregoing article, will be dealt with more briefly in the *Journal*.
—EDITOR.

Wool Instruction for Farmers.—A new position of Wool Instructor has been created in the Department to deal systematically with this side of sheep-farming. Mr. H. H. Chaplin has been appointed to the position, and is attached to the Live-stock Division, with headquarters at Wellington. Mr. Chaplin is well known in wool circles, having had a lengthy practical experience in all branches of sorting, classing, &c., at various large wool-establishments and sheep-stations in the Dominion. He has also twice visited the United States for the special purpose of giving wool-classing demonstrations in that country.

MEASUREMENT OF LAND.

SIMPLE DIRECTIONS FOR FARMERS.

A. MACPHERSON, Fields Instructor, Christchurch.

FARMERS often desire to know the contents of a given area, or to lay off small portions of land for the purpose of experimenting with crops, manures, &c., but find some difficulty in doing it correctly for the lack of a few simple rules to guide them.

The simplest appliances suitable for a farmer to carry out small surveys with accuracy are as follows:—

(1.) A Gunter's chain, which is 66 ft (22 yards) in length, and divided into 100 links, each 7.92 in. long. The more modern steel-band chain measure, having the links marked on one side of it and the feet on the other side, is perhaps the better type, allowing, as it does, of the measurements being taken either in links or feet.

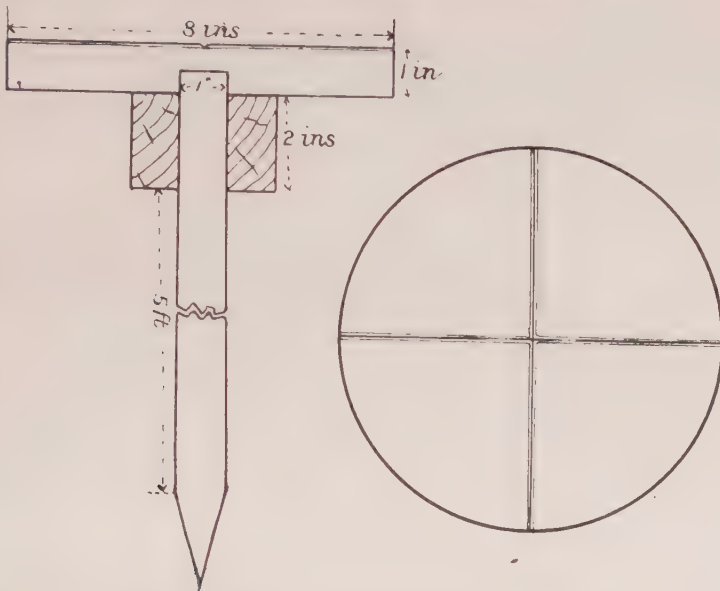
(2.) Ten iron pins or arrows, about 12 in. long, pointed at one end and turned at the other to form a ring or handle.

(3.) A cross-staff, used to ascertain a point on the chain or base line from which a perpendicular will meet an observed point, such as a bend or angle on the boundary-line of a field. This can be made from a round piece of mahogany, boxwood, or other hard timber not likely to warp or split, with a diameter of about 8 in., on which two fine grooves are sawn at right angles to each other. This is firmly fixed to one end of a staff made of ash or hickory, about 1 in. in diameter and about 5 ft. 6 in. in length, the other end being spiked for sticking into the ground (Figs. 1 and 2). Handy metal cross-staff heads (Fig. 3) are also procurable. A simple instrument called the "optical square" is now more generally employed for taking right angles to the chain or base line. It consists of a small circular metal box containing two small mirrors, whose planes make with each other an angle of 45 degrees.



FIG. 3. METAL CROSS-STAFF HEAD.

(4.) A field-book. This book is divided into three columns. In the centre column, beginning at the bottom, are entered the distances successively marked on the chain or base line. In the right- and left-hand columns are entered the perpendiculars from points in the boundary on the right and left of the chain or base line respectively, forming the offsets for side areas. Instead of the foregoing, a good plan is to draw a long line on a page of the field-book, at a suitable angle if required, this to form



FIGS. 1 AND 2. CROSS-STAFF MADE OF WOOD.

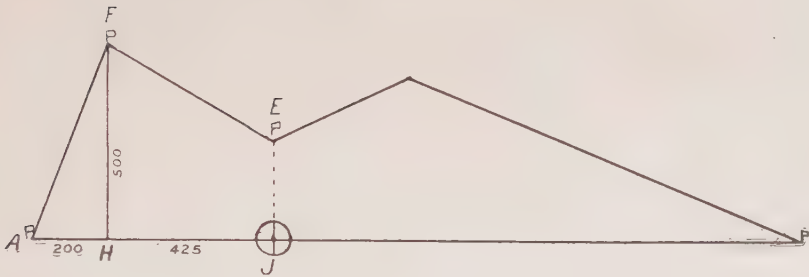


FIG. 4. DIAGRAM OF FIELD BUILT UP AS SURVEY PROCEEDS.

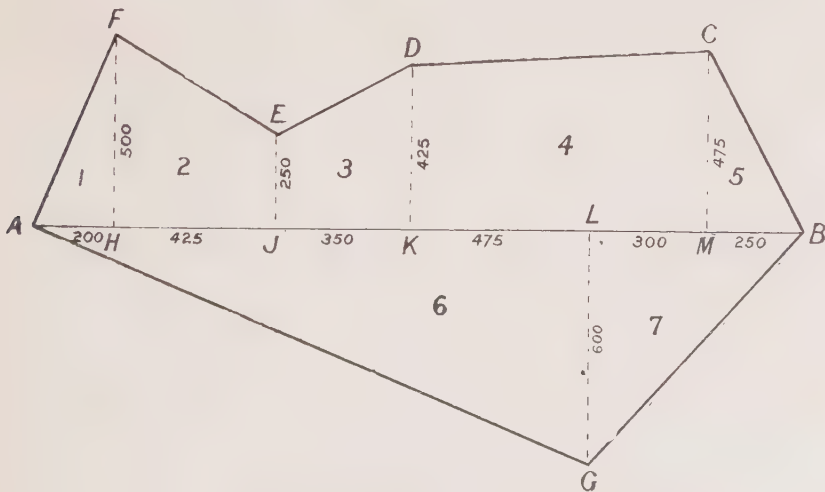


FIG. 5. EXAMPLE OF SURVEY OF IRREGULAR FIELD.

the chain or base line from which the measurements and offsets to right or left are marked. A diagram of the field can be thus built up as the survey proceeds. This method I find to be the simplest and easiest for most farmers to follow and to understand, and it is therefore adopted for the examples hereafter given.

METHODS AND USE OF APPLIANCES.

The base-line should always be taken if possible from the two farthest-away points in the field. To enable offsets to be taken correctly from the base-line a flag should be placed at each point of the line, with one or two flags between in perfect line to facilitate the work.

To use the cross-staff, when taking an offset, the operator places himself on the base-line at a point as nearly a right angle as possible to the object or angle in the boundary-fence which he desires to measure, and, placing the staff in front of him in a direct line with the base-line, sticks the spiked end firmly in the ground. Then, looking along one of the grooves sawn in the headpiece (or, if a metal cross-staff head, through the slots), he adjusts the staff until, on looking both ways, he finds that one of the grooves or slots of the cross-staff

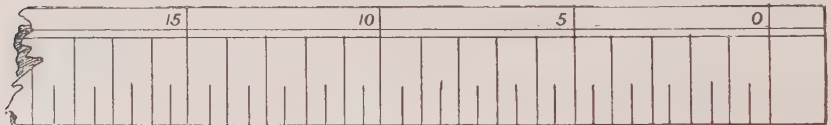


FIG. 6. SCALE OR MEASURE.

points exactly to the flags at both ends of the base-line. Looking along the cross-groove or slot at right angles to the base-line he discovers whether he is at a point on the base-line at right angles with the object or angle he desires to measure to; if not, he shifts the cross-staff either forward or backward along the base-line until he gets the exact position. Fig. 4 shows how the measurements are marked in the field-book and a diagram of the field built up as the survey proceeds. It also shows how the cross-staff is used to find the point on the base-line from which a perpendicular will meet an observed point on the boundary of a field. Having placed a flag at each end of the base-line, the operator begins at A and measures along to a point H on the line, at right angles to the point on the boundary of the field at F. Having ascertained this right angle by means of the cross-staff, the distance—200 links—from A to H is marked in the field-book. Then the perpendicular or offset H to F, 500 links, is measured and marked in the book. The distance, 425 links, along the base-line from H is then measured to a point on the base-line ascertained by the cross-staff at J, at right angles with a bend in the boundary of the field at E, and so on.

SURVEY OF AN IRREGULAR FIELD.

Fig. 5 is an example of the survey of an irregular field, completed and drawn to the different measurements by means of a scale or measure (Fig. 6) and a set-square (Fig. 7).

To compute the acreage multiply the base (in links) of each triangle by its perpendicular height and divide by 2: this gives the area in square links. Point off five figures from the right (that is equal to dividing by 100,000, the number of square links in an acre), which gives acres and decimal fraction. Repeat the process for each triangle, and add together. If it is desired to show the roods and poles, multiply the decimal fraction remaining by 4 (roods in an acre), and point off five figures from the right, which leaves roods; then multiply the decimal fraction remaining by 40 (poles in a rood), and point off five figures from the right, leaving poles with decimal fraction. Example (Fig. 5):—

(1) Angle AH 200 500 HF 2)100000 50000	(2) HF 500 EJ 250 2)750 375 425 HJ 1875 750 1500 159375	(3) EJ 250 DK 425 2)675 337 350 JK 16850 1011 117950	(4) DK 425 CM 475 2)900 450 775 KM* 2250 3150 3150 348750
(5) CM 475 250 MB 23750 950 2)118750 59375	(6) AH 200 HJ 425 JK 350 KL 475 1450 600 LG 2)870000 435000	(7) LM 300 MB 250 550 600 LG 2)330000 165000	Add totals. 50000 159375 117950 348750 59375 435000 165000 acres 13'35450 4 1'41800 40

* KL 475 + LM 300 = KM 775.

Total area, 13 acres 1 rood 16 poles.

16'72000

NOTE.—The area, in square links, of rectangles of irregular shape, but having two sides at right angles to the base-line, such as areas (2), (3), and (4) in Fig. 5, is obtained by taking the average of the two parallel sides and multiplying this by the length of the base-line, as shown in the above calculations for these areas. Thus in (2) $HF\ 500 + EJ\ 250 \div 2 = 375 \times HJ\ 425 = 159,375$.

MAKING A PLAN FROM THE FIELD-BOOK.

Before making the calculations it is very necessary to plot or make a plan of the field, drawn to a suitable scale, showing the measurements. Working out areas direct from the field-book without first drawing a plan of the field to scale cannot be too strongly condemned, as errors may thereby remain undetected which a scale drawing might reveal. For this purpose only a limited number of articles are required, as follows: A ruler graduated into parts of an inch—fifths, or any other suitable number desired—a set-square, and a pencil and rubber.

If a scale is not available, one can easily be made by taking a strip of cartridge-paper, drawing-paper, or even strong brown paper, about $\frac{1}{2}$ in. wide and slightly over 1 ft. in length. With the aid of a carpenter's rule carefully mark on it the inches; then divide each inch into the scale desired—that is, the number of chains to each inch.

The scale used for the purpose of the examples here shown is drawn to 5 chains to the inch (Fig. 6). The scale can be further marked, as shown, to half-chains.

Should a set-square be unobtainable, one can be readily made from a piece of strong cardboard (Fig. 7) in the same way as a right angle can be set out with a chain in the field. Take 30 links on the chain for the base, 40 links for the perpendicular, and 50 links for the hypotenuse (side opposite to the right angle). But in making a cardboard set-square the measurements would be 3 in. for the base, 4 in. for the perpendicular, and 5 in. for the hypotenuse. Care should be taken to make it exact to measurement and cut it out well.

To plot or make a plan from the field-book the procedure is as follows: Midway across a suitable-sized sheet of paper rule a line to represent the chain or base line, making its length greater than will be that of the finished plan. Mark a point A on this, near the left side, to represent where the survey begins. Then on a slip of paper add the several measurements along the base-line, shown in Fig. 5, thus:—

AH	..	..	Links.	200	
HJ	..	..	425		
			—		
			625	A to J.	
JK	..	..	350		
			—		
			975	A to K.	
KL	..	..	475		
			—		
			1450	A to L.	
LM	..	..	300		
			—		
			1750	A to M.	
MB	..	..	250		

2000 A to B = total length of base-line.

Fix the zero end of the scale at the point A, and without removing it mark off with the point of the pencil along the base-line the points H, J, K, L, M, and B, beginning with the measurement AH 200 links, and then taking the total length from A of all the other points, as shown by the totals, up to B, 2,000 links. The perpendiculars or offsets are then drawn from these points by means of the set-square and measured to scale.

CALCULATING AREA FROM PLAN NOT GIVING MEASUREMENTS.

The area which a plan drawn to a scale represents where no measurements are given, such as in Fig. 8, may be obtained by quite a different method, as follows: Having ascertained the scale to which the plan has been drawn, get a piece of tracing-paper and draw on it a base-line longer than the length of the plan; then mark along the base-line with the point of a pencil each chain-length, and draw lines

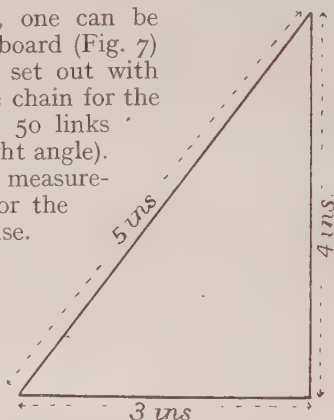


FIG. 7. SET-SQUARE.

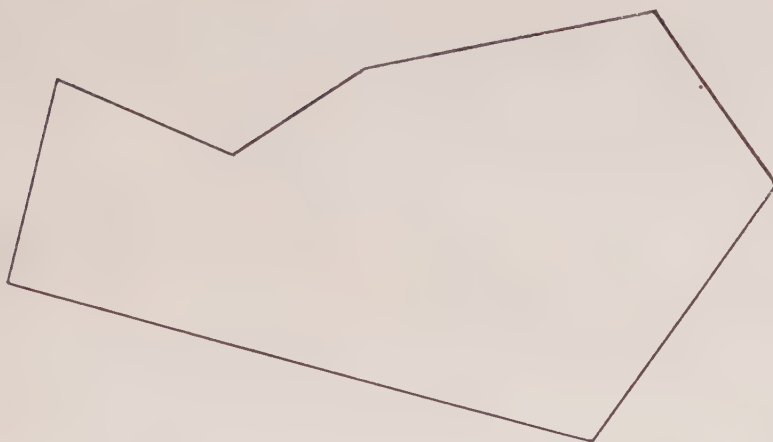


FIG. 8. PLAN NOT GIVING MEASUREMENTS.

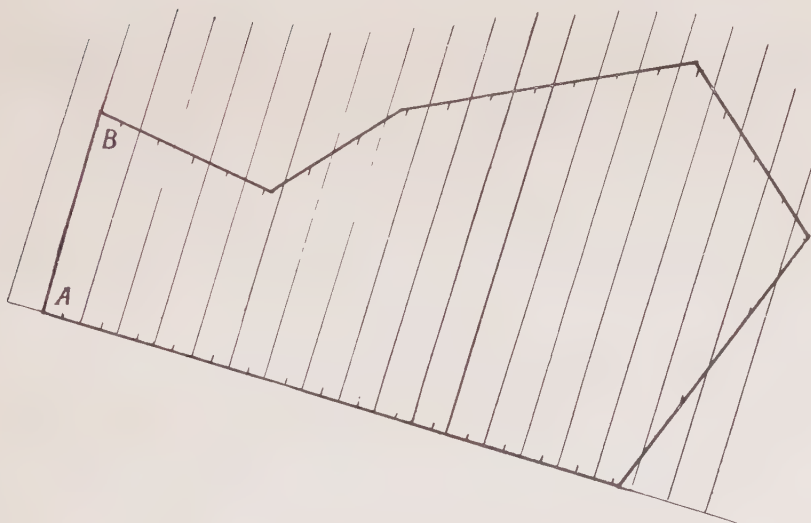


FIG. 9. METHOD OF CALCULATING AREA OF FIG. 8.

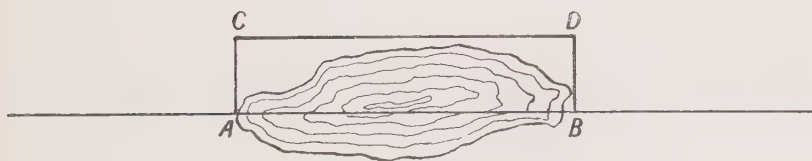


FIG. 10. OVERCOMING OBSTACLE IN MEASURING.

at right angles to the base from these points to a length sufficient to cover the plan. Place this over the plan, as shown in Fig. 9, and fix it and the plan to a drawing-board or table to prevent any movement. Then with the scale to which the plan is drawn measure the distance in length between each chain width at the points A and B, marked in Fig. 9, and so on until each division of the plan between the ruled spaces has been ascertained in the same way as AB. Each measurement in chains and links is taken down and the total added, which gives the same result as obtained in the measurements given in Fig. 5. Example:—

A to B (links) $545 + 510 + 508 + 496 + 475 + 550 + 675 + 725 + 825 + 975 + 925 + 975 + 1020 + 1060 + 1100 + 1000 + 675 + 380 + 36$: total, 13,355 links = 13.355 acres = 13 acres 1 rood 16 poles.

As each measurement taken is 100 links wide it is necessary only to divide the total by 1,000 to convert into acres, or strike off three figures from the right, which leaves the acres and decimal fraction (13.355 acres). This decimal can be converted to roods and poles by multiplying by 4 and 40 respectively, as in a previous example.

OBSTACLES.—BREADTH OF RIVER.—SETTING OUT PLOTS.

When obstacles are met in chaining, some can be overcome as shown in Fig. 10. Erect two perpendiculars AC and BD, of equal length from the obstructed line at A and B; then the measurement CD equals AB.

To find the breadth of a river or inaccessible point in a survey (Fig. 11), start from A (exactly at right angles to E) and run a perpendicular line A to B and B to C—the measurement A to B and B to C must be the same. Erect a perpendicular CD to AC, and on this perpendicular find D in a line with B and E. The distance between C and D will then equal the distance across the river, A to E.

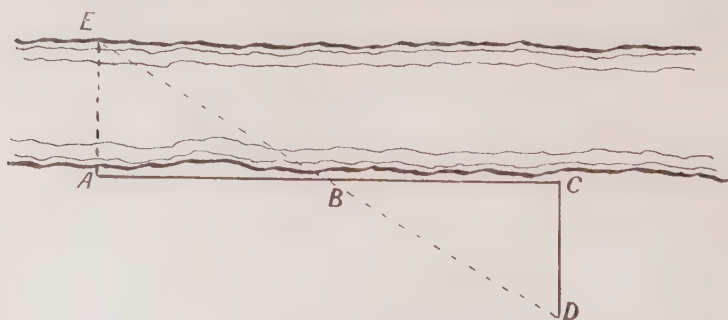


FIG. 11. FINDING THE BREADTH OF A RIVER.

If a farmer desires to set out a number of plots of a definite size in a field for any purpose—say, eight plots each one-fifth of an acre—this can be done either in links or feet, the latter being preferable for such purpose. Take the number of square feet in an acre, 43,560, and divide by 5; this will give 8,712 sq. ft. in one-fifth of an acre. Now measure the length it is desired to have the plots, and divide

the 8,712 sq. ft. by the number of feet in this measurement. The result will be the required width for each plot.

Example: Length of plot 264 ft.; then 8,712 sq. ft. in one-fifth of an acre divided by 264 equals 33 ft. as width of each plot.

TABLES.

The following tables may be found helpful for reference:—

Imperial Square or Land Measure.

144 sq. inches	..	..	..	..	=	1 sq. foot.
9 sq. feet	..	..	..	..	=	1 sq. yard.
30½ sq. yards	..	..	..	..	=	1 sq. rod, pole, or perch.
40 sq. poles (or 1,210 sq. yards)	..	..	..	..	=	1 rood.
4 roods (or 10 sq. chains, or 160 sq. poles, or 4,840 sq. yards, or 43,560 sq. feet, or 100,000 sq. links)	..	..	..	..	=	1 acre.
640 acres	..	..	..	..	=	1 sq. mile.

Gunter's Square Chain Measure.

62,726 sq. inches	..	..	..	..	=	1 sq. link.
2,295 sq. links	..	..	..	..	=	1 sq. foot.
20,661 sq. links	..	..	..	..	=	1 sq. yard.
625 sq. links	..	..	..	..	=	1 sq. pole.
10,000 sq. links	..	..	..	..	=	1 sq. chain.
25,000 links (or 2½ sq. chains)	..	..	..	..	=	1 rood.
100,000 sq. links (or 10 sq. chains)	..	..	..	..	=	1 acre.

NOTE.—Directions for measuring stacks will be given in a subsequent issue.—EDITOR.

FORTHCOMING AGRICULTURAL SHOWS.

Waitemata A. and P. Association: Waiwera, 24th January.
 Woodville A. and P. Association: Woodville, 28th January.
 Helensville A. and P. Association: Helensville, 29th January.
 Te Puke A. and P. Association: Te Puke, 5th February.
 Pahiatua A. and P. Association: Pahiatua, 6th February.
 Clevedon A. and P. Association: Clevedon, 7th February.
 Dannevirke A. and P. Association: Dannevirke, 11th and 12th February.
 Otago A. and P. Association: Dunedin, 11th and 12th February.
 Masterton A. and P. Association: Masterton, 17th and 18th February.
 Egmont A. and P. Association: Hawera, 18th and 19th February.
 Broadwood A. and P. Association: Broadwood, 26th February.
 Franklin A. and P. Society: Pukekohe, 27th and 28th February.
 Northern Wairoa A. and P. Association, Mititai: 28th February.
 Waikato Central A. Association: Cambridge, 2nd and 3rd March.
 Taranaki Metropolitan Agricultural Society: New Plymouth, 3rd and 4th March.
 North Kaipara Agricultural Association: Paparoa, 5th March.
 Te Aroha A., P., and H. Association: Te Aroha, 9th and 10th March.
 Hukerenui Agricultural Association: Towai, 11th March.
 Ashburton A. and P. Association: Ashburton, 18th March.
 Hawke's Bay A. and P. Society: Hastings, 23rd and 24th March (Autumn Show).
 Oxford A. and P. Association: Oxford, 8th April.
 Methven A. and P. Association: Methven, 15th April.

(A. and P. Association secretaries are invited to supply dates and location of their shows.)

PHASES OF FORESTRY PRACTICE.

CANTERBURY EXPERIENCES.

R. G. ROBINSON, Superintendent, Selwyn Plantation Board, Darfield.

[Paper read before the Philosophical Institute of Canterbury, September, 1919.]

PERHAPS at no previous time has the urgent need for judicious management of the Dominion's native and artificially raised forests been so imperative as at present, and with each succeeding year, as statistics reveal the rapid depletion of our timber resources, it is reasonable to anticipate much greater activity in tree-planting not only by the Government, but by local bodies and even private enterprise. The erroneous opinion that a generation must elapse before millable timber can be produced after planting is undertaken is far too general. Men even advanced in years may plant fast-growing species of the pine and gum genera with every reasonable hope to take an active part in the timber cutting and conversion operations some twenty to thirty years later.

It is not surprising, however, that in our midst a widespread belief exists, based on the experience of indifferently managed plantations, that afforestation cannot be made a payable proposition. Many instances might be quoted of magnificent returns from plantations of exotic timber designed and operated upon by practical men and grown on scientific principles, although it needs no specialist to immediately discover the defects, and in consequence financial losses, arising from artificially raised forests wherein trees of entirely different habits are wrongly used in admixture. Throughout the Dominion glaring instances of the unhappy association of trees may be seen on quite a large scale. By reason of their slower development varieties that were originally intended to form the ultimate timber crop were quickly dominated by their less valuable neighbours, thus completely altering the characteristics of the forest aimed at by the originator.

An immense amount of experimental work has been necessary in New Zealand (where the climatic and surface conditions are so extremely varied) to ascertain the respective merits of timber-trees when allocated a position perhaps entirely differing from that of their native habitat. The late Mr. T. W. Adams, of Greendale, did yeoman service in this respect, and to that gentleman arboriculturists generally are much indebted.

Contrary to opinions oft-times expressed, the very fact of a certain species of tree thriving in other parts of the world under almost corresponding climatic conditions to that of one of the New Zealand provinces does not signify that such trees will find a congenial home if introduced to this country. For instance, *Pinus sylvestris* (Scotch fir) has been planted in the colder southern districts at elevations coinciding with those where the parent trees flourish in Scotland, and with

very few exceptions a stunted growth, partially influenced by the contraction of the pine-aphis, has been the outcome.

A popular and natural prejudice against State tree-planting exists, particularly amongst lessees of Government properties that possess attractive qualities from a tree-planting aspect, and no argument advanced in support of a sound afforestation policy seems to weaken our opponents' protestations. In the British Isles, as in this Dominion, the belief is widespread that silviculture on sound commercial lines is utterly impossible. Too often can one advance with little fear of honest contradiction instances of monetary losses accruing from the raising of plantations; but in most cases the failure might be rightly attributed to (a) indiscretion in selecting varieties, (b) indiscriminate association of species irrespective of their constitution or habits, and (c) wrong spacing-distances.

The desirability of utilizing thousands of acres of waste lands within a reasonable distance from railway or water communication for afforestation purposes is apparent to those versed in the critical position of the Dominion's timber-supply, and were the various County Councils and other public bodies to initiate even inexpensive tree-planting schemes over unused lands under their control the effect would be more significant and provide greater local satisfaction than the larger State operations that are confined to widely separated localities. Indeed, under approved skilful management the Government might be prevailed upon to subsidize such undertakings, and in doing so accomplish work urgently needed without being unduly burdened with associated labour problems. The blending of results attained by pioneer tree-planters, State foresters, and present-day enthusiasts with that of Continental experts undoubtedly provides ample data to permit the prosecution of a vigorous afforestation scheme with a feeling of security. It is not my intention to here elaborate on silvicultural methods or theories in general, but rather to review lightly certain outstanding phases of practical results in forestry that to my mind appear worthy of publicity.

SEED-SELECTION.

Progressive farmers insist upon using only seeds of the highest strain for general agricultural purposes, but usually the budding or even advanced forester makes no such stipulations regarding the source of his tree-seeds, relying implicitly upon the assumed knowledge and integrity of the vendor, who in turn depends upon his collectors for the supply of only good seed. It not infrequently happens, however, that gatherers of perhaps *Pinus insignis* seed include in their collection cones from very youthful or deformed parent trees, which, unfortunately, are usually most prolific in their seed-production. On extraction, the seeds from such cones invariably present an almost entire absence of the desired uniformity in body or colour, and repeated experiments, even after dressing, prove their tendency to irregular germination excepting under the most favourable conditions, whilst the eventuating seedlings show a marked absence of the robustness generally attributable to the species. Studies of the factors influencing germination disclose the fact that seeds collected from middle-aged, well-developed specimens (of *Pinus insignis*, say, between twenty and thirty years old) produce most satisfactory results not only in the early stages of propagation, but in later

years when perhaps the uncongenial environment of the tree demands its healthy constitution.

The spring of 1918 will be well remembered as one of the worst ever experienced from a seed-germinating point of view, and the result of a small experiment conducted at Darfield may thus be regarded as of greater value in supporting my contention. From 2 lb. of freshly collected *Pinus insignis* seed taken from a quantity supplied by a well-known seed-firm some 5,050 plants were produced, whilst from a sowing under precisely similar conditions of the same quantity of seeds collected and extracted under supervision from bright well-developed cones taken from trees of good parentage some 8,220 young trees were raised. Experience has confirmed repeatedly that seeds gathered from hardy, acclimatized parent trees are more constitutionally suited for the reproduction of the type of species aimed at for commercial purposes. In propagation work a certain number of seedlings usually disclose a predisposition to weakness by the early contraction of a fungus disorder, or perhaps harbouring congregations of aphis. Other symptoms arising from faulty seed-selection are prolonged stunted growth, or the development of abnormal laterals to the detriment of the leaders. Such seedlings should not be persevered with, as in the desired plantation uniformity should be one of the first considerations with the forester.

Germinating results extending over about twelve years, in my own experience, disclose rather a lower growing percentage than that recorded by the leading Continental writers. It is, indeed, unwise to predict even the probable result from sowing until the examination of the seed-body is made. Seed-germination is influenced greatly by humidity, and it follows that with the increasing severity of the weather and surface conditions the growing percentage becomes smaller. The average germinating percentages of some of the better-known varieties from my own records may be of interest, as follows: *Pinus insignis*, 32 per cent.; *P. Laricio*, 24; *P. ponderosa*, 48; *P. muricata*, 31; *P. austriaca*, 18; *Larix Europaea*, 9; *L. leptolepis*, 7; *Picea excelsa*, 16; *Pseudo-tsuga taxifolia*, 6; *Betula alba*, 2.

Among the gums the hardier varieties, *Eucalyptus viminalis*, *E. Macarthuri*, *E. Gunnii*, and *E. acervula*, will under favourable circumstances show a return of between 17,000 and 25,000 seedlings per pound of seed, whilst from *E. regnans*, *E. fastigata*, and others only from 3,000 to 7,000 seedlings might be expected from the sowing of the same quantity.

NATURAL REGENERATION OF PINE AND GUM FORESTS.

An experiment of more than passing interest is now being conducted in the Dunsandel district, where three years ago the interior of a twenty-year-old *Pinus insignis* plantation was destroyed by fire. Unfortunately, the original mixture included *Acacia dealbata* (silver-wattle), which while under the influence of the fast-growing pines became long, drawn-up, yet inoffensive trees. The fire, not only aided seed-germination throughout, but created a perfect propagating-bed of ashes, in which wattles quickly made their appearance in thousands and grew with amazing rapidity. Almost simultaneously, however, seedling *Pinus insignis* entered the fight for domination, until the whole area relieved of the parent trees presented a veritable thicket

of wattles and pines. On the latter trees becoming well established a clear-cutting of the obnoxious wattles was embarked upon, and the desired spacing uniformity created by utilizing pine seedlings from the more densely covered spots. The partial suppression of the aggressive wattles and simultaneous nursing of the thickly studded pines have been undertaken, and, as circumstances warrant, thinning operations will be resorted to and thus induce girth-development in the remaining standard trees. Undoubtedly the natural regeneration of exotic-pine forests is a simple and comparatively inexpensive proceeding should the objectionable acacias be absent; but immediate, persistent, and well-directed measures are essential to avoid burnt-out mixed pine and wattle plantations from becoming a source of perpetual trouble.

A forestry problem the solution of which would be regarded with general approbation has long remained untouched. Throughout North Canterbury may be seen fairly extensive plantations of silver-wattle, the extreme density of which has been the outcome of prolific seeding and suckering, and although from æsthetic and shelter aspects belts of these evergreens are valuable, in many cases the area covered is quite in excess of requirements. Where the stands are not too dense trees have reached a sufficiently large size for fuel purposes, but the falling or cutting of the tree only emphasizes the trouble. My contention is that the introduction of the more assertive species of the *Eucalyptus* or *Pinus* genera would pave the way for the gradual attainment of a commercially valuable forest, and with this end in view experiments are now well under way.

The simple procedure, which is as follows, may be of interest: Where wattles are dense a clearance of about 2 ft. square is effected, and a sturdy specimen of *Pinus insignis* or a eucalypt possessing dominating characteristics (such as *E. viminalis*) is planted in the centre. Operations are carried out preferably in the winter. Experience already gained has proved that success can be accomplished only if the introduced pine or gum trees become quickly established, otherwise complete suppression by the assertive wattles will be the outcome. *Pinus insignis* is a highly light-demanding tree, and if threatened with suppression by adjacent neighbours when young it will make abnormal vertical development in its efforts to get beyond the injurious shade influence. Should an overhead canopy be too dense the boles of the insignis pine quickly attain a weak, spindly form, and the early decline of the tree is inevitable.

Many of our blue-gum (*Eucalyptus globulus*) plantations, after giving much promise, are again rapidly deteriorating in value by a recurrence of the dreaded scale (*Eriococcus coriacea*) or interference by frost-action. Indeed, it is mystifying how this comparatively tender species has withstood such low temperatures when its extreme sensitiveness to frosts is understood. The prompt action of the Department of Agriculture some years ago in importing and judiciously liberating small colonies of the ladybird beetles (*Rhizobius ventralis*) is gratefully acknowledged by many Canterbury agriculturists whose plantations, much infested with scale before the introduction of the beetles, were soon restored to a healthy state. It is very evident by the early extinction of the colonies of beetles through the absence of their natural food that the scale pest was for a time almost non-existent,

but the plantations are now threatened with a revisitation of the trouble. Under the partial shelter of unhealthy parent gum-trees seedling blue-gums are prominent, but an examination discloses congregations of scale at work along the stems and leaves, destroying the vitality of the young trees. Urgent need for the reintroduction of the ladybird beetles is essential if a repetition of the wholesale damage to timber and shelter belts is to be avoided. The interference with the growth of seedlings at the present stage of regeneration upsets, as regards *Eucalyptus globulus*, the scheme now in its infancy, although, fortunately, so far other hardier species are unaffected.

The temporary closing of plantations against stock is recommended when natural regeneration of gums is being fostered, as even if the animals in a mischievous mood do not bite the tender tree-leaders a certain amount of injury to stems and the ground-surface is caused by their movements.

ACTUAL RETURNS FROM PINUS-INSIGNIS PLANTING.

For the rapid production of light wood throughout Canterbury *Pinus insignis* (well termed the "remarkable" pine) is unsurpassed. Moreover, the value of its wood for packing-cases, interior of buildings, fuel, &c., is receiving increasing recognition, as the shortage of our native white-pine—kahikatea (*Podocarpus dacrydioides*)—and other New Zealand woods have forced users to introduce a substitute. Opinions differ regarding the relative values of kahikatea and *Pinus insignis* timbers. It is generally admitted that the exotic pine possesses many drawbacks; but with such a comparatively sudden awakening to the fact of limited future supplies the question arises whether there is any known fast-growing native or exotic tree adaptable for almost any situation that can rightly supplant the insignis pine. I, for one, know of no such tree. The seeds are easily procured, germination and subsequent propagation work are simple, and fungus and insect scourges are practically non-existent here. Frequently timber taken from a youthful *P. insignis* tree is chosen (by persons desirous of discrediting the value of the wood) for comparative purposes with that perhaps taken from a specimen of kahikatea whose age might well easily run into centuries. Rarely are the insignis pines to be seen growing under conditions suited to their proper development for milling, and it is owing to this fact that sawmillers so frequently express prejudice against the species from a commercial point of view. Wide spacing and injudicious admixture with other light-demanding trees foster the production of strong side branches, and cause the knotty boles so aggravating to the men at the saw-bench.

Thus, throughout Canterbury what appears from the margins to be uniformly planted pine plantations prove on further inspection to be ill-conditioned woods, the milling of which would probably only show a return bordering on 30,000 superficial feet per acre, instead of about double that volume if they had been originally subjected to scientific treatment. This remark is made without any desire to discredit the truly excellent pioneer tree-planting work carried out on the Plains.

In the Coalgate district the milling of a 96-acre plantation, in which such varieties as *Pseudo-tsuga taxifolia*, *Pinus austriaca*, .*P.*

Laricio, *P. muricata*, *P. ponderosa*, *Picea excelsa*, English oak, ash, silver-birch, &c., were used in admixture with *Pinus insignis*, is about completed and furnishes interesting data. Planted about thirty years ago, the trees made excellent headway until the abnormal winds experienced a few years ago levelled many to the ground, thus making a clean cut-out desirable. The complete output from the 96 acres may be put down at 1,600,000 sup. ft. of sawn timber (a large proportion of which has been converted into fruit-cases, soap-boxes, and rough packing-cases), 2,250 cords of firewood, and 2,000 mine-props. Per acre, this is surely an exceedingly low yield. Included in this timber is about 4 per cent. of *Pinus Laricio*, 2 per cent. of *P. ponderosa*, 2 per cent. of *P. muricata*, and about 2 per cent. of other mixed timbers. Based upon the average current prices since operations began, the actual value on the ground of the milled timber may be estimated at £9,500, or, in round figures, £100 per acre—truly a fair return from what might be regarded as a thin and otherwise badly grown forest.

Even where specimens of *P. Laricio* and *P. ponderosa* have developed without interference, the volume of timber secured from these varieties would scarcely amount to one-third that of the *P. insignis* trees occupying similar positions, although from the slower-growing trees the superior quality of the timber is evident. As might be expected, the rapid development of the insignis pine influences the abnormal shrinkage and warping of its timber after cutting, and it requires no expert to understand that the stacking and seasoning of this large-celled wood are phases to which much discretion and skill must be applied. The timber of trees felled during the dormant autumn and winter periods is stronger and possesses less inclination to warp than that cut whilst the sap is active, although, on the other hand, splitting becomes an easier proposition if cutting is conducted in the summer-time.

Two years having elapsed since clearance was effected, this milled area is being restocked by "pure planting" of *Pinus insignis* at 7 ft. apart, *P. Laricio* at 5 ft. apart, and *P. ponderosa* at 6 ft. apart. Marginal lines of *Cupressus macrocarpa* are included in the scheme to partially relieve the more exposed lines of pines from the trying nor'-westers.

Notwithstanding higher yields of insignis pine on record, my experience would indicate that a return of from 60,000 to 70,000 sup. ft. per acre from a well-grown plantation (say, thirty years old) would be a reasonable anticipation. By allowing a profit of 4s. per 100 sup. ft. (a low estimate) after milling and cartage expenses the total credit balance accruing from the proposition should amount to £130 per acre.

THINNING GUM PLANTATIONS.

Realizing the urgent need for a systematic thinning of many of the Canterbury plantations of eucalypts, and being still further influenced by the increasing demand for firewood in consequence of the predicted coal-shortage, the Selwyn Plantation Board wisely decided last year to carry into effect a general scheme whereby the desired thinning and rejuvenation of the Board's gum forests could be carried out with every prospect of the undertaking proving a reasonably remunerative one, notwithstanding the unusually high current rate of wages.

Thinning activities have now been in progress for about a year, and results achieved have more than justified the confidence originally placed in the proposition. Generally the plantations consist of mixed gums in varying stages of development. Dominating specimens, up to about 6 ft. in girth breast-high, may be seen in association with the partially and completely suppressed trees, from the sapling stage upwards. The light thinning consisted of the removal of suppressed and badly grown trees, whilst where necessary a greater growing-space was provided for standards by reducing the density of the plantations throughout.

Trees were cut down to within a foot of the ground-surface, and from the stump coppicing has freely ensued. Perhaps the more important point now is the selection of the shoot to form the future bole. Where intense exposure prevails the shoot growing on the exposed side of the stump should be selected, although consideration must also be given to its sturdiness. By a well-directed blow from the back of an axe all remaining shoots should be severed. The life of the stump will be evidenced for two or more years by its persistent pollarding, notwithstanding the frequent application of the foregoing measures. Measures to promote coppicing should be conducted preferably when the sap is down or in the early spring-time. Before the termination of the growing season several shoots will issue from the stump, and the earlier the selection of an individual leader the better. With each succeeding operation, however, the root-system of the stump becomes more disorganized, until the weakened coppicing entirely ceases.

Briefly, where circumstances demand, in dense gum plantations, after the trees have attained a reasonable height, the object should be to (a) effect uniformity and provide a space sufficient for moderate girth-expansion; (b) foster regeneration by the raising of seedlings over the more isolated spaces; and (c) carefully avoid interference with the required standards. Thus a two-storied forest will be the outcome, enabling systematic cutting to be arranged at periods suitable for the disposal of the timber. The age of the trees now being operated upon ranges from twenty to thirty years, and after removing between six and twelve cords of firewood, or an equivalent, per acre, the standing timber may be reasonably assessed at 28,000 sup. ft. per acre.

Little publicity has in the past been given to reliable data concerning the progress of eucalypts under forest conditions. Sample plots are being prepared throughout the Canterbury Province to determine the precise volume of standing timber, and by periodical measurements interesting and reliable information will be gathered, and thus more accurately disclose the possibilities of hardwood production under various conditions.

PLANTING-DISTANCES AND SHELTER-BELTS.

Insufficient recognition of the intense importance of allocating a correct spacing-distance when planting trees is almost universal. Irrespective of the existing humidity, or surface being operated upon, a standard spacing between each tree is generally regarded as satisfactory by planters, even when afforesting on a comparatively large scale. The following conclusions, however, will indicate the results of opinions formed after lengthy experience over varying surfaces and altitudes:—

(a.) That generally the faster the development of any variety of tree the greater may be the spacing-distance allotted.



ONE OF THE SELWYN BOARD'S GUM PLANTATIONS (30 YEARS OLD) BEFORE THINNING.



THE SAME PLANTATION AFTER THINNING.

(b.) That in sheltered valleys where humidity is more intense and the surface more fertile there is no occasion to plant so densely as on the hillsides ; and generally the more exposed and otherwise unfavourable are the planting-conditions the greater the necessity for closer planting.

(c.) That with the increasing tendency of varieties (such as *Cupressus macrocarpa*) to produce strong laterals the need for a lesser growing-space becomes correspondingly more pronounced.

Thus in operating with *Pinus insignis* or gums on the Canterbury Plains, 7 ft. apart pure planting is an excellent spacing-distance between the trees if the object is to produce millable boles without having recourse to heavy thinning-work. Should, however, a humid valley possessing a surface and substratum congenial to the growth of pines be afforded, the spacing might be increased with perfect safety to 8 ft. between each tree, although with increasing elevation and exposure and tendency for the trees to develop protective laterals greater density (say, 6 ft. to 7 ft. apart) is required to bring about the desired result.

In raising shelter-belts, however, the production and retention of the side branches are points of paramount importance, and the crowding of trees so necessary for clean bole-development must be strictly avoided. Therefore, should the conditions warrant a spacing-distance of 7 ft. for timber purposes, from 8 ft. to 9 ft. apart would be sufficiently close if several lines for a shelter-belt are needed. Where only one line is possible and the characteristic of the tree is of little moment one might incline to the closer spacing with feelings of security. The following abbreviated table showing the suggested economic planting-distances for the average Canterbury land will not be out of place here, although variations after the manner advocated in the preceding remarks are worthy of consideration before a decision is arrived at on this important point by the tree-planter :—

				Distance apart (in Feet).	
				For Timber.	For Shelter.
<i>Pinus insignis</i>	..	..	..	7	8 to 9
<i>Pinus ponderosa</i>	..	..	..	5 to 6	7
<i>Pinus Laricio</i>	..	..	..	5	6
<i>Pinus muricata</i>	..	..	..	..	8
Eucalypts	..	..	..	7	8 to 9
<i>Cupressus macrocarpa</i>	..	..	..	5	8 to 9
<i>Pseudo-tsuga taxifolia</i>	..	..	..	5 to 6	8
<i>Larix leptolepis</i>	..	..	..	5	..

Apart from the more pleasing results attained by judicious spacing, the tremendous importance of this phase from an economic standpoint is obvious. At 6 ft. apart some 1,210 trees are required to plant an acre of land, whilst at 8 ft. apart only 680 trees are needed. Oft-times farmers, in their ambition to simultaneously produce branchless boles and shelter, will plant trees of the *Pinus insignis* type at 4 ft. apart, anticipating the early removal of alternate trees. Long poles will certainly be the outcome, but the provision for shelter will be defeated, inasmuch as the protective branches will be absent through overcrowding ; again, plantations thus formed rarely fail to collapse when subjected to winds of more than ordinary severity. Should trees of the

scaffolding-pole type be aimed at, dense pure planting (at, say, 5 ft. to 6 ft. apart) is recommended, complete clearance to be effected as occasion demands. Marginal lines of a deeper-rooting tree of the *Populus*, *Pinus ponderosa*, or *Cupressus macrocarpa* types create a support for the plantation body, and in addition tend to promote humidity and accelerate height-progress.

A somewhat effective though hideous pioneer shelter-fringe is created by topping the exterior line or two of pines. Should the severing of the leader immediately above the whorl be skilfully undertaken before trees have exceeded the desired height little disfigurement is the outcome, although perhaps a repetition of the operation would probably be inevitable. The popular wholesale amputation of tops and branches should be discouraged by those keen on preserving a naturally artistic effect.

Tall-growing pines should not be planted within at least half a chain of the road fence-line, although should one so desire and the conditions lend themselves to the project the intervening space might with much advantage be converted into an attractive shrubbery. The common error made by many worthy pioneers of planting up to within a few feet of the roadway and divisional boundary-fences with *Pinus insignis*, irrespective of the ultimate certain obstruction to thoroughfares and adjoining properties, is, unfortunately, still being practised. By using such trees, however, as *Cupressus Lawsoniana*, *Wellingtonia gigantea*, the spruces, &c., as an ornamental and shelter barrier the deleterious effect is not so far-reaching as when the fast-growing pines have been chosen for the purpose.

The sacrifice of belts of splendidly grown trees fringing roadways over which the Lake Coleridge electric power is transmitted to Christchurch has caused some consternation amongst owners and the travelling public generally, who realize the probability of losing still more of the valuable wayside shelter-belts should any further reticulation project cause the transmission-wires to be further directed along other courses. So with the expansion of the electric-power service and the evident necessity of disfiguring arterial roads with transmission-poles too much stress cannot be laid upon the risk associated with road-line improvements. To my mind, an immediate survey and public definition of the main routes over which the power will be carried should be made by the authorities, so that intending planters may with confidence beautify their holdings without the fear of having to destroy perhaps magnificent road-avenues of trees just as their maximum value from æsthetic and shelter aspects is reached. That the bark blown from gum-trees (the worst offenders) adjacent to the high-power wires frequently causes a short circuit has been proven beyond a doubt; but we have yet to learn what distance the transmission-wires must be from the offending trees to be beyond the influence of the loose bark during the prevalence of a strong nor'-wester.

TREES RECOMMENDED FOR COMMERCIAL PLANTING IN CANTERBURY.

Much diversity of opinion exists regarding the selection of trees for general afforestation work in Canterbury, and even those well versed in the subject, after long continuous experiments supported by observations whilst abroad, are not at all unanimous on the point. Land

that will simply grow trees may prove absolutely incapable of yielding a crop sufficiently well grown to make the undertaking financially sound. Then, again, the prospective planter usually chooses his poor-quality land, but it not infrequently happens that he gives little consideration to the under-stratum after feeling satisfied that the surface conditions are favourable for tree-life. True, a fertile surface will cause speedy headway during the early life of the tree, but as the root-system descends into perhaps an objectionable pan or waterlogged stratum it is not difficult to understand in that case the sudden change in the health of the tree. It is unreasonable to expect better-class timber to be grown on intensely porous land which on examination discloses only a few inches of medium surface soil covering a deep stratum of shingle.

Abundant evidence has been produced substantiating the contention that slowly but regularly grown wood possesses a better texture than that raised with greater speed, although over dredged tailings, shingle-pits, and such surfaces the tendency for the timber to become "pumped" is decidedly acute.

Suitable planting-areas that may be regarded at present as inaccessible will probably with the further progress of motor traffic in the heavier transportation work be linked up with railway centres or junctions at no distant date. This fact is worthy of consideration by those more isolated landholders who now hesitate to plant for fear of inability to market the produce.

A few brief remarks on trees of proved commercial value may be given a place here :—

Softwoods.

Notwithstanding the liability of the tree to become uprooted during the prevalence of high winds, particularly when no provision has been made for protecting the exposed margins, I am convinced that *Pinus insignis* should be given first place among the softwoods. The high esteem in which the New-Zealand-grown insignis pine is held may be gleaned from the remarks made to me in 1914 by two eminent Continental foresters, Dr. Henry and Mr. Elwes, who affirm that our *Pinus insignis* is assuming characteristics almost unknown in the species in its natural home (California), plainly indicating that our conditions are ideal for the propagation of the tree. It not only grows strongly in its youth, but continues to prosper even on the lightest lands. The full uses to which the timber can be put have yet to be discovered ; but for cases, joinery, interior building-construction, and fuel purposes it surely meets many requirements.

Pinus ponderosa (yellow pine) and *Pinus Laricio* (Corsican pine) are two exceedingly hardy varieties. They are both more wind-firm than the preceding species, and the timber is of better texture. Both, however, require a longer rotation, although when allocated congenial situations a vertical development of between 15 in. and 18 in. annually may be expected.

Pseudo-tsuga taxifolia (Douglas fir, or "Oregon pine") : The value of the timber of this shade-bearing American tree is universally known. Perhaps the susceptibility of the leaders to injury from high winds is its greatest drawback. The tree is otherwise hardy, but, like other

members of the *Abies* family, it prefers rich, loamy, cool surfaces. For restocking a partially cut-out forest where abnormal shade prevails the Douglas fir is excellent. Two other varieties that may be recommended for this purpose are *Thuja plicata* (Pacific red cedar) and *Abies Mer-tensiana* (black hemlock). Possessing also highly ornamental characteristics, the Douglas fir should at least have a junior place where the conditions lend themselves to the inclusion of graceful evergreens.

Hardwoods.

Of the tried hardwoods such gums as *Eucalyptus viminalis* (manna-gum), *E. Macarthuri* (Paddy River box), *E. amygdalina* (peppermint-gum), *E. Gunnii* (cider-gum), *E. coriacea* (white-gum), and *E. gigantea* (swamp-gum) have shown their partiality for the less trying positions on the Canterbury Plains and resisted even the most severe frosts. *Eucalyptus globulus* (blue-gum) and *E. obliqua* (stringy-bark) may also be seen thriving, but these species are much more sensitive to climatic changes, whilst the former variety readily contracts scale discomforts even when neighbouring specimens of other gums are perfectly free from the pest. *E. obliqua* seems to be most satisfactorily grown in admixture with other more hardy species.

Medium Woods.

Cupressus macrocarpa (Monterey cypress): This tree should not be despised, particularly by the farmer who needs durable fencing-material. Planted closely—say, 5 ft. to 6 ft. apart—on soil of medium fertility the trees should attain a sufficiently large size for general farm use in about twenty to twenty-five years.

Larix leptolepis (Japanese larch): On the higher elevations in cool sheltered situations this tree will grow very quickly. The mature wood is extremely valuable for all general purposes, whilst saplings (cut at the right time and partially seasoned) are easily converted into fencing-stakes. The autumnal tints of the tree, blended with some of the darker-foliaged varieties in the immediate vicinity, add considerably to the attractiveness of a holding. Larches should not be planted on the Plains, where they fall an easy prey to the needle-shedding trouble.

At intervals throughout a plantation a few lines of fire-resisting trees, such as varieties of *Populus* or *Betula alba*, afford greater security to the forest, and form a starting-point for back-firing should a conflagration arise.

BRIEF CULTURAL NOTES.

Although no attempt will be made here to detail tree-propagation methods or planting-systems a few points of importance on associated matter may aid the rising arboriculturist to greater success. The more unfavourable the planting-conditions the more imperative is the need for operating with sturdy and otherwise well-balanced young trees. In cultivated, partially sheltered ground a fair measure of success may be expected by using yearling plants that have not undergone transplantation, but which if allocated less congenial situations would utterly fail. Perhaps the tendency for tree-planters to secure big trees irre-

spective of their root-system accounts for much of the unprofitable work conspicuous in windy localities.

The wrenching of pines and other evergreens in nurseries, to induce fibrous root-development and harden off the plant-stem, should be insisted upon by purchasers. Many of our progressive nurserymen strictly adhere to this desirable practice, although there are others who maintain that the little benefit arising from the root-cutting operation scarcely justifies its adoption. To my mind, the success in planting out is greatly emphasized by a rapid transition of the tree from the nursery line to its permanent situation, as the physiological disturbance created by a disorganized root-system is then less sustained. A very large percentage of failures may be traced to lengthy transportation of trees, prolonged confinement of trees in bundles or cases, and faulty heeling-in prior to permanent planting.

Another important point inseparable from successful planting is the effective firming of the tree by foot-pressure. It not infrequently happens that the subsequent swaying movement of the young plant causes vacuum from the stem to the roots, but if attended to in time no ill effects follow beyond a temporary lull in sap-activity. This wind-shaking trouble may be partially avoided by planting the tree against the back of the prepared pit on the side farthest from the prevailing wind. Contrary to the popular belief, tree-roots readily strike out against the more solid side, and naturally have a more tenacious hold than those issuing through the pulverized soil.

The oft-repeated question, "What is the best time to plant?" requires the support of surface and other details before an intelligent reply can be given. Generally, early spring planting (say, towards the end of August) is attended with most success, but, of course, this is conditional on the trees being allowed to remain in the nursery lines through the winter. Pines in bundles are very subject to heating if permitted to remain for any length of time in trenches. In spring planting, trees seem to receive less check and become more quickly established than those put out in the autumn or winter, there to remain dormant for months, in many cases alluring rabbits and becoming loosened by winds and lifted by frost-action. It is wise, though, to also duly consider the likelihood of early rains after planting before a decision is arrived at.

Paspalum Seed.—Great care should be taken in buying *paspalum* seed at the present time owing to the very inferior seed on the market. New-Zealand-grown seed of the 1919 season should on no account be sown unless its germination capacity has been first ascertained. Australian seed seems fairly satisfactory.—*Biologist*.

Limestone Samples.—Samples analysed recently by the Chemistry Section gave the following content of carbonate of lime: Chancet, Ward, 73 and 85 per cent.; Kaipara, 92.5, 86.5, and 87.5 per cent.; Napier, 92 per cent.

WORK FOR THE COMING MONTH.

THE ORCHARD.

AFTER an enforced spell of four or five years there appears, at the time of writing, every prospect of shipping-space being available for the export of fruit this season. This will mark a very important stage in the development of the fruit industry in the Dominion. Owing to the ships being diverted through the Panama Canal there seems little possibility of the South American market being available, but no doubt the North American and English markets will afford a good outlet for our fruit. Orchardists must rise to the occasion and establish a good name for New Zealand fruits. If they aim at producing the best, New Zealand fruit will soon become as well known as its butter and cheese. To bring this about and ensure success all connected with the industry must do their part well.

Much depends on the orchardist—on the manner and way he handles the fruit. Too much care cannot be exercised in the orchard. Pick only those fruits which are ready and will pass the colour requirements. Sever carefully from the tree, and, if possible, leave the stem intact. Apples with the skin torn at the stem are of no use for export. The necessity of careful handling cannot be too much emphasized. This was very forcibly demonstrated in the cool-storage experiments conducted last season. Any handling-bruise will show up by the time the fruit reaches its destination overseas. Once fruit is picked, keep it in the shade and away from the direct rays of the sun. Speed it away to the packing-shed, and arrange to have a full and competent staff of graders and packers to handle it expeditiously. There should be no delay anywhere; the interval between picking and packing should be the shortest. Once packed, place the fruit promptly in the cool store to await shipment, even if this period is only a few days.

The grader has a most important function to perform, as it is his duty to maintain the standards defined for export, and any fruit that is in the least doubtful should be rejected without hesitation. The packer should also do his share of the work faithfully. It is only by the combined efforts of all those concerned in the production of the fruit and preparing it for market that a good name for New Zealand can be established on the oversea markets.

The general work for the month is dealt with in the district notes which follow.

—Gordon Esam, Acting Assistant Director of the Horticulture Division.

AUCKLAND.

The harvesting of stone-fruits is now in full swing. Careful attention must be given to this important part of the year's operations, but growers should endeavour to avoid neglecting other seasonable operations. Mid-season varieties of pip-fruits will soon require to be gathered also. The mistake is too often made of picking fruit at the wrong time, sometimes too soon, before it is matured, and at others at the overripe stage. The correct time will be indicated very largely

by the vigour of the trees and class of land. Growers should give due consideration to this factor and use their discretion, as much loss is incurred annually in this respect, particularly by stone-fruit growers. Many instances came under my notice last season where the despatch of stone-fruits, and in some cases apples and pears, fully ripe, was much delayed. This upsets prices considerably, and with stone-fruits it is conducive to development of brown-rot.

The present is the most suitable period for carrying out budding operations.

As soon as the last jam strawberries are gathered, spray plants throughout with bordeaux, 4-4-40, for leaf-spot. As a preventive measure against infection of stone-fruits by brown-rot during the ripening-period a spray of commercial lime-sulphur, 1-125, or self-boiled lime-sulphur, 8-8-50, is recommended. Continue the regular three-weekly application of arsenate of lead for control of codlin-moth, leaf-roller caterpillar, and leech on pip-fruits until the time of harvesting arrives. Spray English and Japanese plums with arsenate of lead, 1 lb. (paste) to 50 gallons, for control of cherry-slug. In cases where citrus trees are affected with scale or thrip, and where the young growth has sufficiently hardened to permit of it, spraying should be undertaken with red oil, 1-40.

Spraying summary.—Peach, nectarine, and plum: Commercial lime-sulphur, 1-125, or self-boiled, 8-8-50, when fruit reaches ripening-stage.

Pear, apple, and quince: Commercial lime-sulphur (33° test), 1-100, in conjunction with arsenate-of-lead paste 1½ lb., or powder ¾ lb., to 50 gallons water, every twenty-one days.

Lemon and orange: Bordeaux, 4-4-40, when petals have fallen from main crop of blossoms; red-oil emulsion, 1-40, when spring growth has hardened (after bordeaux).

Strawberry: Bordeaux, 4-4-40, when fruit is all off.

—J. W. Collard, Orchard Instructor, Auckland.

HAWKE'S BAY.

A number of varieties will be ready to pick during February. A good deal of fruit becomes useless each year through being removed from the tree too soon. Immature fruits shrink badly and become quite as useless as fruits which are allowed to become overripe before picking. Pickers will do well to remember that all the fruit on one tree cannot possibly be ready to pick at one time, and to get the best marketing results selection should be practised and each tree picked over as occasion demands. When the fruits are removed from the tree they should be shaded as much as possible from direct sunlight, and handled without delay.

Codlin-moth and leaf-roller: Repeat applications of arsenate of lead. Many growers withhold the arsenate, as no moth is evident, only to find that the broods which hatch out at this time nullify all the good spraying-work of the past. It is not uncommon to find young grubs hatch in case-fruit where spraying has been suspended too early. At this season of the year arsenate may be applied with advantage up to within a few days of picking.

Black-spot: Keep a good lookout for live fungus, and apply lime-sulphur, 1-100, or bordeaux, 3-4-40.

Woolly aphis: Blackleaf 40, 1-800, has proved the most satisfactory summer control. This preparation may be used in combination with arsenate of lead or lime-sulphur, or both, but if used alone 3 lb. of soap per 100 gallons should be added.

Red mite: As indicated in last month's notes, regular application of lime-sulphur will be necessary at this period to control active mites.

Leech or pear-slug: This pest will be well to the fore throughout the month, and arsenate of lead, 1 lb. paste or 10 oz. powder to 50 gallons, should be applied as a control.

Powdery mildew: Spray infected trees with lime-sulphur, 1-100, or atomic sulphur, 10 lb. to 100 gallons, every three weeks.

Plum-rust: Spray with bordeaux, 3-4-50, or lime-sulphur, 1-120, paying particular attention to trees which were infected last season.

—W. M. Rice, Orchard Instructor, Hastings.

NELSON.

The main apple-harvest will soon commence, and preparations for handling it should be completed. Packing-sheds and stores will need to be put in order. The latter will be all the better if fumigated with burning sulphur. The crop, it is to be remembered, is bulky and perishable. Study to reduce the handling as much as possible, and have the conditions in the air-cooled store right—i.e., dark

and cool, and ventilated at night and in cold weather. Arrange to deal promptly with cull and waste fruit. If there is no other use for it neighbouring farmers will be glad of it for their pigs.

It is very possible that part of the crop will be exported to North America, where the port inspection is exceedingly strict, as some growers know to their cost. As it is no consolation to know that codlin-moth, leaf-roller, or black-spot developed on the voyage, it is desirable to spray the crop two or three weeks before picking, in order to avoid the disappointment and loss of having it condemned. Mid-season and late stone-fruit, too, will require a similar attention as a preventive of brown-rot and other troubles. In this case spray the trees a month before picking with lime-sulphur, 1-125, or self-boiled lime-sulphur, 8-8-50.

In young orchard sections the cultivation will need to be maintained and a careful watch kept to see that blight does not interfere with the completion of the season's wood. Spray at once should the need arise. Leaf-roller, leech, or aphids are the most likely troubles. The autumn is probably the very best time for carrying out a thorough spraying campaign and ridding the trees of their unwelcome attentions.

While lime may be applied to the orchard requiring it almost at any time, the end of February is probably the most suitable. Manures and cover-crops have comparatively little effect without lime. Lime is constantly demonstrating itself to be the best corrective of the mechanical and chemical condition of Nelson soils. Apply it with a distributor over the whole area of the orchard.

The present season of the year is right for "budding" most fruit-trees.

—William C. Hyde, Orchard Instructor, Nelson.

MOTUEKA.

Cultivation should be thoroughly attended to during February, as after that the busy period of harvesting the main crops will not allow much time for cultural operations. Summer pruning may be carried out, as recommended in last month's notes.

Keep the arsenate-of-lead spray on apples and pears for late broods of codlin-moth and leaf-roller caterpillar. Fruit for storage should show plenty of traces of arsenate-of-lead spray to prevent the ravages of leaf-rollers, which so often do considerable damage to fruit in storage. Remember there is no market for moth-infected fruit, not even in the factories, therefore immediately an infected fruit is noticed it should be picked and destroyed, otherwise it will only be robbing the tree of nutriment that should be going to clean fruit, besides spreading infection by rearing the larvæ. Apply a late spraying of lime-sulphur, 1-120, to prevent later infections of black-spot. This should also apply to fruit for storage. Last season's experience of the development of black-spot in stored fruit would then be obviated to a great extent. The lime-sulphur spray will also be found beneficial for control of red mite. When applying spraying-mixtures do not neglect woolly aphids wherever it appears. Wash the aphides right out with high pressure and give them no chance to congregate in colonies.

Fruit for export should be carefully selected and only the very best sent forward. Avoid packing immature or overripe fruits, choose the happy medium and make it the best quality. Make certain that no diseased fruit enters the cases. See to it that the work of preparing the fruit for market is carried out by qualified graders and packers. Keep a uniform standard grade of quality, and have the fruit properly sized. Used the diagonal pocket system of packing, and have no "rattle" in finished cases. —W. T. Goodwin, Orchard Instructor, Motueka.

CANTERBURY.

Growers will be kept busy during February picking and marketing their crops. Sufficient has already been said in these notes with regard to the marketing, although it cannot be too strongly emphasized that the better the general get-up the better will be the price. Attention should be given to the actual picking of the fruit, remembering that fruit picked immature usually shrivels before being placed on the market, while overripe fruit soon decays. The correct time to pick the different varieties can only be learned in the orchard. Seeds and colour help to determine whether fruit is mature or not. There should be at least two pickings from every tree, as all fruits do not mature at the same time. When picking, care should be taken not to destroy the fruit-spur, or the next season's crop will be lost. Pip-fruits should be picked with the stems intact, thus preventing any fungus or rot disease from entering the fruit at this point.

Spraying should be continued throughout the month, following the directions given in previous notes. One more spraying with arsenate of lead for codlin-moth on the later varieties should be sufficient; another application of Black-leaf 40 if woolly aphis is on the increase; and should there be a late development of black-spot on pears bordeaux, 3-4-40, should be applied.

During the month attention can be given to any summer pruning that is necessary, eliminating all unnecessary growth and treating laterals for the formation of fruit-buds for the next season. Budding can be done with success during the early part of the month. Full instructions are given in Bulletin 81 issued by the Department.

—George Stratford, Orchard Instructor, Christchurch.

OTAGO.

Growers will now be hard at work harvesting the stone-fruit crop, and other operations in the orchard are liable to be neglected. This is very often the case with necessary spraying, and considerable loss is often occasioned by omitting a further spray of arsenate of lead for codlin-moth and leaf-roller, also cherry and pear leech.

Woolly aphis still needs looking after with Blackleaf 40 on the lines indicated in last month's notes. Black-spot made great headway during early February last year and caused severe losses; growers should therefore be on guard this season and keep a careful watch for this, spraying with lime-sulphur, 1-120. Present indications are that the infection is much earlier this season. The same measure should be taken in regard to mildew.

Peach-rust was also bad last season in many orchards, especially on the Lady Palmerston variety. Spray these with lime-sulphur, 1-140, to help keep the trouble in check. Atomic sulphur can also be used for this disease, at a strength of 1-10. Where the growth is heavy and the centres of the trees full of young shoots it will be found advantageous to remove the latter, so as to let in the light and air and give the fruit a better chance to ripen and colour. The fruit-buds for next year will have a better chance to ripen up also. Thinning of apples can still be undertaken where necessary to relieve overcrowded or stunted trees. Cull out the diseased and deformed fruits during this operation.

—J. H. Thorp, Orchard Instructor, Dunedin.

POULTRY-KEEPING.

F. C. BROWN, Chief Poultry Instructor.

WITH the rapid growth now being made by the young stock, and little culling having yet been carried out, the accommodation on the plants of many breeders is fast becoming overtaxed. In order to lessen the risk of overcrowding and its evil effects on the birds no time should be lost in disposing of all cull cockerels that have attained a marketable age. This will not only add to the comfort of the remaining stock on the plant, but will also effect a considerable saving in the food-bill. Of course, it is from the early-hatched cockerels that selections should be made for future breeding purposes. They should be carefully gone through, and none but the strongest and best types should be retained for the renewal of stock. In this connection it is always a good plan to select more males than those actually required, for some of the birds may have to be rejected at a later date. It often happens that a male bird when young looks very promising, only to prove disappointing when a more developed stage is reached. On no account should a late-hatched cockerel, or one that comes to maturity at an extremely early age, be selected. These seldom or never grow to a desired size, and therefore prove next to useless when the mating-time comes round. As a general rule it is the big-framed slow-maturing male bird with active habits that makes the best sire.

The feeding of the stock of the various ages on the plant at the present time requires considerable judgment on the part of the poultry-keeper. A common mistake made in this direction is to provide a similar ration to all birds alike. The quality of the food should be in accordance with the age of the birds and the object aimed at. For instance, if the adult birds are to give their maximum egg-yield a fair proportion of animal food is an essential. In the case of the growing pullet, however, meat and other similar forcing foods should be sparingly supplied. In fact, if there is any sign of the birds coming to prematurity these materials should be eliminated from the ration, or the birds are apt to commence laying before a desired size and a proper healthy development has been attained. It is not generally known that when a pullet commences to lay she ceases to grow. Therefore, instead of hastening production with the pullet intended for winter laying, she should be kept steadily growing, and everything done to promote health and constitutional vigour. Having this in view, a good range under the most natural conditions possible, shelter from cold winds and shade from sun, together with roomy quarters and strict attention to cleanliness, are factors that must not be overlooked.

FEATHER-PULLING.

Several inquiries have lately reached me asking for a cure for feather-pulling. This is one of the troubles affecting poultry for which there is no actual cure, prevention being the only real means of dealing with it. The first step is to find the cause and remove it at the earliest possible moment. It is usually the result of keeping the birds in too confined quarters, or allowing them to become badly infested with vermin. The parasite usually responsible for fowls acquiring the habit of feather-pulling cannot be seen by the naked eye. It is at the root of the feather and causes severe irritation to the bird. It is in order to get rid of this irritation that a bird will allow its feathers to be plucked out by its mates. The only remedy is to give the birds more range and make sure that there is no vermin present. The first step in the latter direction is to keep the house in a thoroughly clean state and give periodical sprayings with a strong disinfectant. Further, see to it that the birds are provided with a good dust-bath, as this is an essential if they are to rid themselves of the annoying parasites. When it is not convenient to increase the range for the birds, and they are being kept under confined conditions, everything should be done to keep them well occupied by way of exercise. Ample litter should be provided in which the hard grains should be scattered. This will keep the birds busy in searching for the food, which will go a long way towards making them forget the feather-pulling vice.

LEG-WEAKNESS.

Keep a watchful eye on the forward chickens for leg-weakness. This is usually the result of an oversupply of forcing-food or the lack of exercising-space. When once a bird becomes badly affected with this trouble it should be killed, as it is next to useless trying to cure it. Prevention is the one and only safe course in dealing with this trouble, and the only reliable method is to eliminate rich foods, such as meat, milk, &c., from the ration, and provide ample exercise.

INQUIRIES.

I am continually receiving letters asking for advice on the treatment of stock affected with certain troubles arising generally from improper management, but seldom do the writers supply the information necessary for me to understand the cause, much less to suggest a remedy. Inquirers cannot be too explicit in describing any trouble they desire advice upon. Full details of the symptoms observed, together with the system of feeding and the general conditions under which the birds have been kept, would prove most helpful. In the case of trouble being met in the hatching and rearing department, full particulars should be furnished as to whether artificial or natural methods are being adopted. This, with particulars as to the make of incubator used, and whether heated or cool brooders are being worked, would greatly assist me towards arriving at an opinion as to the cause of the trouble.

THE APIARY.

G. V. WESTBROOKE, Apiary Instructor.

EXTRACTING OPERATIONS.

At this time of the year the operation of extracting the honey should keep the successful apiarist fully occupied. Where a good "flow" of nectar is on it may be necessary to keep the extractor constantly going in order to provide storage room for the bees and to prevent them blocking the brood-combs with honey. This "high-pressure" extracting may be avoided where the beekeeper has a plentiful supply of drawn-out combs and spare supers to place on the hives. It is estimated that by giving the bees completed combs the yield of honey will be double that obtained if they are supplied with sheets of foundation only. The time occupied in drawing these out into comb during a short flow may result in a serious loss to the beekeeper, hence the necessity of taking great care of the combs.

In large apiaries it is usual to have two persons to do the work of taking the honey for extracting. One manipulates the smoker and bee-brush, while the other takes out the frames of honey. The latter operator first gives the frame a sharp shake to remove the bulk of the bees and then hands it to the other person, who brushes off the remaining bees and then places it in the carrier or super on the barrow. When robber-bees are about it is advisable to have a cloth damped with a weak solution of carbolic to cover the frames as they are removed. Only ripe honey should be taken from the hive. The beginner should therefore take care to see that more than three parts of the combs are sealed over by the bees. They will not as a rule seal over the cells until it is ripe.

In place of the bee-brush many prefer to use a small branch of manuka or other soft-leaved shrub. The advantage of this is that it can be burnt after use, in case there is any danger of the honey containing spores of foul-brood. This precaution, however, should not be necessary, as no careful beekeeper would allow his bees to go

so long before treating the disease, but would have eliminated it before the extracting season.

Where queen-excluders have not been used it will be necessary to see that there is no brood in the combs removed. If frames containing small patches are found they should be placed at the sides of the super; when the brood hatches out the cells will be filled with honey, and they can then be extracted. If frames containing eggs and larvæ are found in the super they should be placed with the queen in the bottom box, and if possible a queen-excluder put between, so as to prevent her again ascending to the supers. Any capped brood may be left in the supers.

When the honey is removed it should be immediately taken to the extracting-room, which should be bee-proof. As the honey is more easily extracted while warm the work of uncapping and extracting should not be delayed. In large apiaries the steam-heated uncapping-knife is now in general use, but where this is not available it will be found best to keep the knife hot by means of a vessel containing hot water which is placed over a small lamp. It is an advantage to use two knives, so that while one is in use the other is getting hot for the next comb. The uncapping should be done over an uncapping-can, or over a cappings-melter. The can should have a strainer about three parts of the way down. On top of the can is a bar of wood from which projects a short spike; the frame rests on this, so that it may be placed at any angle to suit the convenience of the worker. To allow the cappings to drop into the can the frame should be tilted slightly forward. The cappings may be left in the can for a day or two to allow them to drain; they can then be pressed to secure the remaining honey, and melted up.

The beginner usually commences with a two-comb extractor. A reversible one is much easier to work than a fixed type, as it saves lifting out the frame after one side has been extracted. Experience will soon teach the best speed for turning. It is important to see that the extractor is placed level on a fairly solid foundation. If a platform is used it must be made very strong, as the vibration caused by the revolving weight will be very severe on it. The wet combs after extracting should not be taken out of the room until evening, when they may be placed on the hives again. This precaution will probably prevent robbing starting.

VITICULTURE.

S. F. ANDERSON, Vine and Wine Instructor.

THE COOL VINEHOUSE.

FROM this time on, so long as there is any growth at all, the vine should have perfect freedom. It now has three to five months to build up and store for next season's production of fruit those essential qualities that restore the fertility of the plant. The roots, wood, and buds can now get that full benefit of the strong foliage that has been kept back for the benefit of the fruit. This applies particularly

to the growth made at the top of the house. It matters not how tangled a mass it appears, it is all helping to strengthen the vine. I have often gone into vinehouses after the fruit has been gathered and found a great part of the foliage cut away with the mistaken idea that it was not required, or for the purpose of getting rid of or controlling mealy bug, mildew, &c. If mealy bug is present, now is the time to cyanide, for no injury to the vine is likely to be done. If it is mildew, give it the treatment recommended for that trouble, but do not cut out the foliage. Another factor in the encouragement of this strong autumn growth is the reciprocal action between the foliage and roots. As the autumn advances the sap elaborated by free growth descends and adds to the extremities of the roots that nourishment helpful to future production. Some growers have remarked that cutting back the vine at this stage plumps up the buds at the base of the laterals that have borne fruit. They certainly do fill out, but they cannot store up that energy for future effort so well as when the foliage is left on to ripen off in a natural manner.

OUTDOOR TABLE GRAPES : THE ALBANY SURPRISE VARIETY.

The Albany Surprise, owing to its immunity from mildew, and its large bunches of acceptable fruit, has largely replaced the European varieties that have hitherto been grown for the table. Wherever a vine will grow outdoor this vigorous variety appears the most reliable. The general public are fast becoming reconciled to its peculiar flavour. It should not, however, be put on the market till perfectly ripe, as its acidity is very high when not fully matured. Being a very strong grower and long-jointed, it requires plenty of room and long pruning, and therefore cannot permanently be grown within the same limits as the European vines. Heavy crops of well-ripened fruit are being grown in the ordinary way on espalier fences. The habit of the variety demands different treatment, however, and a few years' close pruning will cause the vines to go back in vigour. Growing on sloping banks and covering places such as low rocks, keeping the rods about 1 ft. off the ground by stakes, the fruit ripens well. For general planting, from 10 ft. to 20 ft. apart each way is close enough. The vines should then be trained over the ground, as described and illustrated in the *Journal* for March, 1917.

THE GARDEN.

W. H. TAYLOR, Horticulturist.

VEGETABLE-CULTURE.

THE planting of broccoli, cabbages, cauliflower, savoy, brussels sprouts, and kales should be completed at once in all but the warmest situations. If planting extends far into February failure is probable, as in most places there will be too short a period of warm weather to promote development. Cauliflowers of the Autumn Giant type are an important crop. If good plants are put out the heads should be

ready about Easter-time, coming in before the earliest broccoli and filling a gap consequent on the finish of peas and beans.

Final plantings of celery should be made at once. The plants should be well supplied with water until they get into good growth, when a dressing of nitrate of soda should be given. It would be practically useless to give nitrate of soda while heavy watering is being done, as, being very soluble, it would mostly be washed away. Leeks should be planted at once; if left much later they will not succeed. For winter use of spinach sow the prickly-seeded variety about mid-February. This is a crop worth growing well, being practically immune from disease or insect troubles. Sow in rows 12 in. apart, and thin to 9 in. or 10 in. apart. A suitable fertilizer is superphosphate, four parts, and sulphate of potash, one part, giving 4 oz. per square yard; a dressing of nitrate of soda, $\frac{3}{4}$ oz. per square yard, to be given after thinning. Other things that may be sown include French beans, turnips, carrots, lettuce, raddish, silver-beet, and onions for salading.

Tomatoes: Attend carefully to the suppression of side growth. Spray about every fortnight with 4-4-40 bordeaux mixture. Soda may be used in place of lime, in which case use 5 lb. instead of 4 lb. of lime.

Cucumbers under Glass.

The culture of cucumbers in frames is a comparatively easy proposition; almost any person with intelligence can manage it with some degree of success. Their culture in glasshouses, where they must be trained up the rafters, is quite a different matter. This is not an appropriate time to deal with the whole subject, but recent observations show that a few remarks may be of use to those who with little or no instruction are attempting to so grow them and often failing. It may be said at once that this is one of the "fine arts" in horticulture, and complete and unailing success depends on the grower having a thorough understanding as to what the plants require and how to handle them. I have found it very hard to get beginners to believe that the fruit will grow without being fertilized, yet this is one of the most essential points. Although the fruits do not hang long enough for the seeds to ripen, the growing of seeds at all is exhausting to the plant. Further, when a fruit bears seed it is a bad shape, the lower end being invariably swollen. Symmetrically-shaped fruits are obtainable only by not allowing them to bear seeds. The fruits grow as well without seeds as with them, and as the process of bearing seedless fruits is not exhausting, except in so far as the roots eventually impoverish the soil, a set of plants can be kept in full bearing from early spring to late autumn, when the weather gets too cold. In the process the haulm is renewed by cutting back leaders and securing new, and by constant pinching and regulating the secondary leaders. From the very beginning all the male blossoms should be pinched out as soon as they form. People to whom it seems strange that a fruit can grow without being fertilized will perhaps be reconciled to so curious a fact when it is pointed out that bananas rarely contain seeds, and are not fertilized. All the figs that are grown, with the exception of the Smyrna fig, are from unfertilized female blossoms. There are also seedless oranges, seedless pears, and at least one variety of grape that is seedless.

Cultivation and Fertilizing.

A few weeks of dry weather is usual at this season, and good cultivation is necessary to conserve soil-moisture. The hoe or cultivator should be in frequent use to keep down all weed-growth, and maintain a loose surface to act as a dust mulch to prevent the escape of moisture.

Growth should be encouraged by giving a light dressing of nitrate of soda, a salt that is very potent in its effect, particularly where little or no animal manure has been used. The usual fertilizers—superphosphate, &c.—are not sufficient in the culture of green vegetables when stable or farmyard manure is wanting; there is still something lacking. In such cases nitrate of soda acts like magic. A teaspoonful scratched into the soil around a young plant that is just starting growth after being transplanted will soon promote strong growth. Five or six weeks later, when the plants have made some headway, a further dressing of the nitrate should be given by broadcasting, allowing about $\frac{3}{4}$ oz. per square yard.

A useful liquid manure for green crops generally is superphosphate four parts, nitrate of soda two parts, and sulphate of potash one part. Use 1 oz. to each gallon of water, and give sufficient to moisten the soil presumed to be occupied by roots. Note that this mixture should not be applied more than twice or thrice during the growing-period of any crops.

SMALL FRUITS.

Strawberries: The fruit season being past, the opportunity offers for breaking up the soil between the rows, an operation that should not be neglected. The soil between the plants in the rows is also liable to become hard on the surface; it should be loosened, or, if that is not practicable, some loose soil drawn up from between the rows. This refers, of course, to beds that are to be kept for another year. The production of runners should be restricted. It is best to set aside certain rows for propagating new plants, so that the major part of the plantation may be kept in a good state of cultivation, which has an important bearing on the maintenance of the plants in a thrifty state.

Red currants: As all the fruit is borne on spurs on wood that is more than one year old the object should be to encourage their formation. Branches must not be crowded, as light and air are necessary to make fruitful spurs, which will be formed on every part of the branches. If a bush becomes crowded the lower parts of the branches will become barren. Strong side shoots that have been made this season should be cut down to 6 in.; this will encourage the formation of new spurs at the base of the shoots. Be sure not to cut them shorter, for if that were done the lower buds would probably break into wood-growth and the purpose be defeated. Where borers are troublesome the bushes may be sprayed with lime-sulphur, 1-100. This is not a complete check, but it is of considerable value.

Black currants: These bushes do not require summer pruning.

Gooseberries: Bushes that are in a crowded state may be profitably relieved of some of the branches at this time. The effect will be to relieve the bushes of an unnecessary burden in carrying useless growth through the dry season. It will also admit light, and materially strengthen buds on the inner parts of the branches. Spray the bushes with 4-4-40 bordeaux as a check to leaf-spot.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

PASTURE FOR GERALDINE DISTRICT.

W. M. HARRIS, Pleasant Valley, Geraldine :—

Please advise me as to the best mixture of grasses, giving quantities of each, to sow on land intended for dairying. The land is fairly heavy on a stiff clay bottom, and is at present in wheat. I intended sowing it down with rape and grass next November. Would this do well after wheat?

The Biologist :—

The following mixture is recommended for permanent pasture on your country : Perennial rye-grass, 15 lb.; cocksfoot, 15 lb.; crested dogstail, 4 lb.; timothy, 4 lb.; red clover, 3 lb.; white clover, 2 lb. The practice of sowing down permanent pastures with rape, &c., is not to be recommended. The addition of rape means early feeding off, which is detrimental to the young pasture plants, particularly so in a dry season. It would be preferable to sow your rape in November alone, and in the autumn to lightly work the rape-stubble and sow down the above specified permanent pasture.

FORAGE CROPS FOR SHEEP.

J. C. NEILL, Weraroa :—

Please inform me what would be the most profitable feed to sow broadcast during January or February on good fallow land in this district, crop to be fed off on ground during July and August by (a) lambing-ewes, (b) fattening wethers. It is intended to use the land next season for mangolds and swedes.

The Agriculturist :—

To sow in January or February for lambing-ewes or wethers there is no crop more suitable than turnips, preferably Imperial Green Globe, Romney Marsh, and Centenary Green Top, in the order named. Cereals sown at the time mentioned would require feeding off, say, in April, and would consequently lose vitality and not produce much feed at the time required. Another plant which will yield a big bulk of feed is Thousand-headed kale. This would be more suitable for wethers than for ewes. With both this and turnips dry feed should be given the stock. Ewes should be kept off turnips on frosty nights. Sow at the rate of $1\frac{1}{2}$ lb. to 2 lb. per acre of turnips or kale, mixed with 2 cwt. of superphosphate, per acre. Broadcast sowing can be done by hand or drill, taking off coulter and tubes and allowing seed to fall from openings of box. If the roots or kale are not grown the next best thing would be oats sown in April.

STOCK AND TUTU.

W. E., Puketitiri, Napier :—

As there is a good deal of ground tutu on portions of my property I should be glad if you could advise me as to the safest time to put stock unused to the weed on this land.

The Live-stock Division :—

At no time is it absolutely safe to permit stock to eat this shrub. Tutu is most dangerous to stock when eaten on an empty stomach or immediately after they have been taken off roots, also when the young shoots of the shrub are beginning to spring. It is also liable to be harmful in a dry season, with scarcity of feed, if stock are transferred from clean ground on to tutu-infested paddocks.

FAILURE TO REAR CATS.

"CATS," Aria :—

I have tried unsuccessfully for the last three years to rear cats. They grow and look fat until about three months old, when they start to vomit and die in about twenty-four hours. I have opened the last four and find in each case that the gut is full of hard worms about 4 in. long with broad-arrow heads. Will you kindly advise treatment and feeding? We give them all the new milk they can drink.

The Live-stock Division :—

The probability is that the heavy infestation by the worms you describe (*Ascanis mystax*) is the cause of death. We would advise you to administer once monthly $\frac{1}{4}$ grain santonin and $\frac{1}{4}$ grain calomel, either as a powder or pill, for three alternate days—all food being withheld for at least twelve hours previously. Twice this dose may be given to adult cats. The only precaution to be taken as regards feeding is to see that the food is cooked and feeding-utensils kept clean.

GROWING SILVER-BEET FOR POULTRY.

T. H. RUTHERFURD, Masterton :—

I shall be glad of advice regarding the growing of silver-beet as green feed for poultry. When should it be sown, and for how many years will it continue to yield? I have had some in now for two years, but have obtained only very light cuttings, as the plants always run to seed.

The Horticulture Division :—

For practical purposes silver-beet should be planted every year. The plants always run to seed the second season, and the leaves are then very small. For supplying poultry-feed the seed should be sown in spring in fairly good soil. Thin the plants to at least 10 in. apart. By sowing at once you should get a good supply of leaves during winter. A fresh lot should be sown in spring, as those sown now will probably go to seed next season in a shorter time than if they were sown in spring.

DEALING WITH HORSE BOT-FLY.

"SUBSCRIBER," Henderson :—

Could you suggest a simple method of keeping the bot-fly off and out of horses?

The Live-stock Division :—

Where an animal is in constant work this can be accomplished by the attendant scraping or singeing the eggs off as soon as they are deposited on the hair. The method, however, is not applicable when horses are running in the pasture. In such cases a mixture of creosote and oil can be used—2 drams of creosote to a pint of oil. This should be lightly smeared all over the body. To be effective it should be applied every few days; and it is the usual experience that most horse-owners would rather run the risk of having their animals affected with bots than be put to the trouble of applying the treatment.

CREAM-SEPARATION.

"CREAM," Kaitoke :—

Please tell me why 5 gallons of night's milk yields $5\frac{1}{2}$ pints of cream, while little more than 3 pints of cream is obtained from 6 gallons of morning milk.

The Dairy Division :—

Providing the milk is in normal condition there should be no material difference in the proportionate amount of cream separated from a given amount of milk, irrespective of whether the milk be from the morning or evening supply. In all probability the reasons for the variation in the quantity mentioned are due to the speed of the separator and the quantity of milk which is allowed to pass through the machine. The separator should be run at the speed specified by the

makers, and the quantity of milk should be in accordance with its capacity. If, for instance, the speed of the separator is not up to the maximum the volume of cream will be increased, and there will also be some loss of fat in the skim-milk. If too large a quantity is allowed to flow through the machine the same thing will apply. On the other hand, the volume of cream will be much less if the flow of milk is reduced below the capacity of the machine. It is imperative that both the speed of the separator and the quantity of milk passing through it be regular, when there should be no practical difference in the volume of cream in proportion to the quantity of milk handled.

SELF-SUCKING HEIFER.

"SETTLER," Ruawhata :—

Will you please advise what is best to do with a heifer that sucks herself? She is a three-year-old grade Jersey, lately calved.

The Live-stock Division :—

The appliances used to prevent this form of vice are many and varied. Some are effective, but most of them are undesirable to put into operation, as they prevent the animal from having the free use of the head to lick itself or drive away flies from the fore quarters. They also prevent freedom in feeding, and are a continual source of annoyance not only to the animal, but also to the dairyman. It would be far better to allow this heifer to rear her own calf, and perhaps also another one, or get rid of her as fat. Should you, however, decide to try some device, methods observed in use include the following: A strongly made leather halter with a few spikes about an inch long attached to the noseband, which is supposed to prevent her getting freely at the teats without hurting the udder. Or a leather headstall and bodyband, with a pole the thickness of a broom-handle attached between, this preventing the head from reaching the udder.

LAWSONIANA SHELTER-HEDGE.

E. T. WISE, Te Poi, Waikato :—

I should like your advice regarding the best trees to grow for shelter-hedges in this district, and the month in which they should be planted. Trees which will grow quickly and which cattle will not eat are required. Could you also tell me the best and cheapest way to procure the plants?

The Horticulture Division :—

Cupressus Lawsoniana has proved to be pre-eminently the best plant for shelter-hedges in the Waikato. The plants are raised from seeds, which may be sown in boxes early in March. The young seedlings should be ready for transplanting into nursery rows the following spring, and for planting out a year later. It may be preferable to obtain the trees from a nurseryman, saving more than a year and obviating risk from failure to raise the trees satisfactorily. They may be planted in May, or in the spring about August. Plant 30 in. apart.

HORSE WITH SHOULDER TROUBLE.

C. MULLIGAN, Kapuka, Southland :—

Kindly advise me what treatment to give a horse with his shoulder out.

The Live-stock Division :—

The probability is that your horse is suffering from what is known as shoulder-slip, or supra-scapular paralysis, a totally different condition from displacement of the joint. The horse may or may not get better from this condition. The only treatment likely to be of any use is the application of stimulating liniments to the shoulder-muscles. Usually horses affected with this complaint can work without any inconvenience. If the shoulder is actually out, the horse should be cast with the affected shoulder uppermost, and a rope be applied to the affected limb, which should then be stretched as far as possible while pressure is applied to the affected joint. Unless a dislocation is attended to within a few days, replacement is difficult, if not impossible.

CARBON BISULPHIDE FOR RABBIT-POISONING.

For some time past the Department has been endeavouring to arrange for cheaper supplies of carbon bisulphide for use in coping with the rabbit pest, and the following summary of the information already obtained concerning the prospects of importation and local manufacture is published for general information. The subject is still being followed closely, and there will probably be more to report at an early date.

IMPORTATION OF SUPPLIES.

In March, 1917, it was suggested by one of the Department's officers that the Government should import a quantity of carbon bisulphide from England, and distribute it to the farmers at prices sufficient to cover the expenditure involved. Owing to the serious advance in the market price of carbon bisulphide in New Zealand its use as a rabbit-poison was at this time practically discontinued. The High Commissioner, London, was therefore requested by cable to obtain quotations for 5 tons, in 5-gallon drums, at per gallon, f.o.b., British port. The quotation duly received was £320, f.o.b., London. This, amounting to £64 per ton, was considered too high a price, and the Department did not accept the offer.

The subject was again brought up in December, 1918, when the Fields Inspector, Queenstown, reported that some of the farmers in the Arrowtown district had been using carbon bisulphide for rabbit-poisoning, and that in consequence their farms were exceptionally clean. Owing, however, to the very high price of the material some of the farmers could not afford to purchase it. The price of the article was then said to be £160 per ton, and the Inspector recommended that the Department should import stocks of this very effective supplement to the other various modes of destroying rabbits. The question was then submitted to the Department's Chemist (Mr. B. C. Aston), who reported that whereas the pre-war price of carbon bisulphide in wholesale quantities would be about 2½d. per pound in Germany and other manufacturing countries, the price ruling then (February, 1919) for the limited supplies available in New Zealand worked out at approximately 1s. per pound. The Chemist therefore suggested that inquiries should be made by cable in Australia for commercial carbon bisulphide, and that the shipping charges should be definitely ascertained. With this data—initial cost and shipping charges—it would be possible to say whether the local price was fair or excessive.

A quotation and the particulars of freight were duly received, and, reporting on the figures then available, the Chemist stated, "Comparing the estimate of the Dunedin firm with that of the Melbourne quotation, I find that the cost of the former would be 1s. 0¾d. per pound, f.o.r., Dunedin, and the latter 8½d. per pound, c.f., New Zealand ports. This would apparently amount to some £42 per ton saving, but this is not taking into consideration insurance, and cost of landing and storage in New Zealand." Subsequent information disclosed that the local rate had advanced again, and it was decided to import 2 tons of carbon bisulphide from Australia. This was duly distributed through the Fields Inspectors, a consignment going to the North Island and another consignment to the South.

In the meantime a communication was despatched to San Francisco to ascertain the price ruling there. The quotations received from the United States were slightly lower than the Melbourne prices, but the Director of the Live-stock Division pointed out that there was the question of longer storage to be taken into consideration with a liquid of so volatile a nature as carbon bisulphide, and that in the absence of any previous experience in this respect he did not feel disposed to recommend the experiment of importing from San Francisco.

In July, 1919, a further supply of 7 tons was purchased at Melbourne at the approximate cost of £68 per ton landed in New Zealand.

With regard to the shipping question, the Union Steamship Company stated, "Our rule in connection with this article is that it must not be carried on any passenger-ships. On cargo-ships the freight from Melbourne and Sydney, without transhipment, is 70s. per 40 cubic feet or 20 cwt.—whichever is the greater."

PROPOSED MANUFACTURE OF CARBON BISULPHIDE IN NEW ZEALAND.

Owing to the considerable difficulties and expense connected with the importation of carbon bisulphide, it has been suggested that the material should be manufactured in New Zealand. This proposal was referred to the Chemist, who submitted the following report, dated 18th July, 1919:—

"As the constituents from which carbon bisulphide is made are sulphur, charcoal, and coke or coal there is no doubt that it could be manufactured in the Dominion. There might be some difficulty in obtaining an officer with the experience necessary to run such a works, but there are full details of the methods used in the past, and those now used in American works by electrically heating carbon and sulphur (Taylor's patent) can be found in Wellington libraries. The question to consider is what amount of carbon bisulphide can be used in New Zealand, and whether it will pay to erect a plant for producing this amount rather than to import it from Australia.

"In the *Journal of the Franklin Institute*, February, 1908, p. 141, a full account is given of Taylor's patent. With an expenditure of 100 h.p. 5,000 lb. of carbon bisulphide can be produced in twenty-four hours, but production by stronger alternating currents could be raised to 10,000 lb. in twenty-four hours. The furnace is 16 ft. deep by 41 ft. high; there are forty electrodes arranged crosswise, and two dynamos of 330 kilowatts working at 30-60 volts will produce 14,000 lb. to 15,000 lb. in twenty-four hours; with increase of current the same apparatus would produce 25,000 lb. in twenty-four hours. Each electrode consists of twenty-five carbons, 4 in. by 4 in. by 48 in., so that each electrode has a section of 20 sq. in. (*sic*). The electrodes last a year. These are placed at the foot of a vertical shaft furnace filled with small pieces of coal and charcoal. The replacing of the charcoal takes place by a side canal at the side of the furnace. Melted sulphur flows in below the electrodes, and then is vaporized through the hot carbon."

Mr. L. Birks, Chief Electrical Engineer, Public Works Department, was asked for his opinion on the proposal to manufacture the material locally, and the following is the substance of the report which he kindly supplied after consideration of the literature and information placed before him by Mr. Aston:—

"The manufacture of carbon bisulphide appears, from the data you submit, to be suitable for hydro-electric development on a small scale, if the market is available for the output. Taking the output given by Taylor (p. 144) of 5,000 lb. per day of twenty-four hours, with 100 h.p.—say, 11 tons per week or 350 tons per year of thirty-two weeks, leaving twenty weeks for overhaul and repair of the furnace—the cost would apparently be roughly as follows:—

	Per Year.	Per Ton.	Per Pound.
Raw material at, say, £8 per ton delivered, and, say, 80 per cent. efficiency of conversion ..	£ 3,500	£ 10.0	d. 1.07
Electricity, 85 k.w. at £10 per kilowatt-year ...	850	2.4	0.26
Labour—say, twelve men at £220 per year each	2,640	7.6	0.81
Electrodes, say	100	0.3	0.03
Packing, say	1,500	4.3	0.5
Management, repairs, and contingencies ..	1,500	4.3	0.5
Total working-expenses	10,090	28.9	3.17
Interest—say, £12,000 at 6 per cent. ..	720	2.1	0.22
Depreciation—say, £10,500 at 10 per cent. ..	1,050	3.0	0.32
	11,860	34.0	3.71

"Assuming the whole 350 tons per year can be sold, this should be saleable at 4d. per pound, or 36s. per hundredweight, *f.o.r.*, at the works. This figure should leave a substantial margin of saving to cover any slight deficiency in the demand. But if only one-half the above amount can be sold the price would probably have to be increased substantially to cover costs, unless the business can be run as a seasonal business, when the freezing-works are closed down, enabling spare power and spare labour to be utilized to advantage during the off season—say, August to December. It might actually be run in conjunction with a large freezing-works or fellmongery, in which case most of the charges would be substantially less for a reduced season of working than if run as an independent business—particularly the marketing charges, which are not included in the above figures."

It will be noted that Mr. Birks has calculated the expense and equipment for an output of 350 tons per annum, but this is considerably more than could be utilized in New Zealand at the present time. The Department considers that the most it could now use for rabbit-poisoning in the Dominion would be 30 tons a year. Inquiries are, therefore, being instituted as to the possibility of establishing a smaller manufacturing plant than one turning out 350 tons per annum.

In the meantime, however, the foregoing information may be of interest not only to farmers, but also to manufacturers who are desirous of obtaining a cheap fat and rubber solvent. If a constant demand for carbon bisulphide could be guaranteed the local manufacture of the material by the electrical method of heating might be started.

EXPORT OF APPLES TO HONOLULU.

THE embargo preventing Australasian fruit entering the Territory of Hawaii has been recently removed so far as apples from New Zealand are concerned. The following is the proclamation to that effect issued by the Governor of the territory, dated 31st October, last:—

"Section 1. For the purpose of preventing the introduction into the Territory of Hawaii of fruit-flies and insects, their eggs, larvæ, or pupæ, and all diseases of plants, fruits, or other vegetation of value, all persons, companies, and corporations are hereby prohibited from introducing, importing, or bringing, in baggage or otherwise, into the Territory of Hawaii, or into any of its ports for the purpose of disembarkation into the said territory, any fresh fruit from East or West Indies, Asia, Australasia, Oceanica, Malaysia, Mexico, Central and South America: Provided, however, that fresh apples may be imported into the Territory of Hawaii direct from New Zealand in cold storage only, if they are free from insect pests and plant-diseases, and are accompanied by a Government certificate declaring that the apples have been grown in New Zealand and are shipped free from insect pests and plant-diseases, and are also accompanied by a Government certificate declaring that they have not and will not come in contact with Australian-grown fruit on the voyage to the Territory of Hawaii."

The Director of the Horticulture Division (Mr. T. W. Kirk) has been in communication with the executive officer of the Hawaii Board of Agriculture Commissioners, who supplied him with the foregoing information and also the following facts, which will be useful to exporters:—

"The three leading firms in Honolulu which could handle New Zealand apples are: Theo. H. Davies and Co. (Limited), American Factors (Limited), and Fred. L. Waldron (Limited). The representative of Davies and Co. informs me that he would be willing to handle New Zealand apples on consignment, taking 10 per cent. on the gross sale price in Honolulu. The present wholesale price for Californian apples in Honolulu is 3 dollars per box. All of the firms listed above are reliable, and handle practically all of the wholesale business and importation in this territory. The certificates which are required to accompany apple shipments should be sent to Mr. E. M. Ehrhorn, Chief Plant Inspector, P.O. Box 207, Honolulu."

Intending exporters should consult the Fruit Inspectors at Auckland, Wellington, Christchurch, or Dunedin before shipment.

Certificates in Pruning and Spraying.—In the list published in the November, 1919, *Journal* the name of Mr. F. W. Cone, of 50 Langdon's Road, Papanui, Christchurch, is given in the second class. Mr. Cone gained a first-class certificate last year.

Utility Poultry for Breeding Purposes.—The price-list for birds from the Department's poultry-stations has been revised as follows for all breeds: Cockerels and drakes, 15s. and 20s. each, according to selection; pullets and ducks, 15s. each; coop included in all cases.

Control of Rabbit Nuisance.—The Maungakawa Rabbit District, in the Waikato, has been formally constituted.